INSTRUCTION BOOK

RDR-1 AIRBORNE RADAR SYSTEM
Type CON-1( )
CONTROLS

BENDIX RADIO
DIVISION OF BENDIX AVIATION CORPORATION
BALTIMORE 4, MARYLAND

I.B. 734-1

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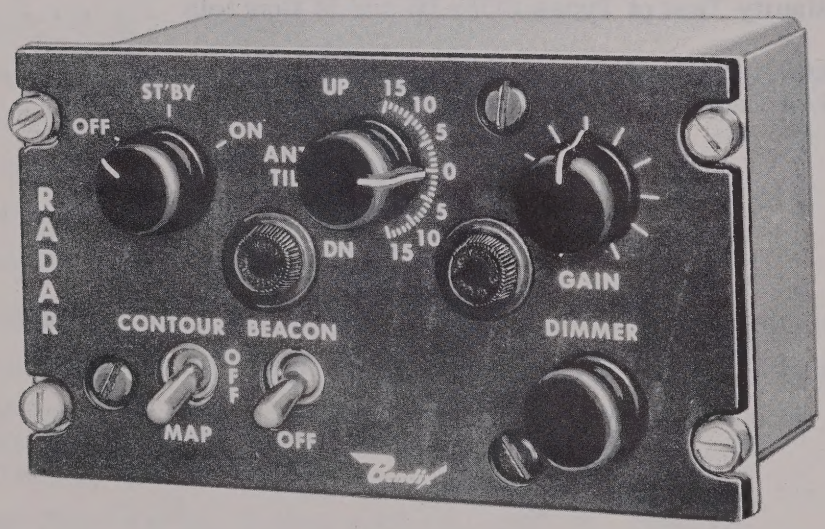


Figure 1-1. CON-1D Control, Part of RDR-1 (X-band) Airborne Radar System

SECTION I
GENERAL DESCRIPTION

1-1. GENERAL.

The Bendix type CON-1( ) Control is the remote control unit for the Bendix type RDR-1 Airborne Radar System. The control unit shown in figure 1-1 is a type CON-1D Control for use in X-band systems; however, there are several different types for use with X-band and C-band systems.

This instruction book (I.B. 734-1) contains a general description of control unit types CON-1A, CON-1B, CON-1D, CON-1G, CON-1J, CON-1L( ), CON-1M, and Conversion Kit CON-1K. Circuit theory, maintenance and servicing data, and parts lists are included.

This instruction book is a part of, and must be used with, the RDR-1 Airborne Radar System Instruction Book I.B. 732 (for X-band systems) or I.B. 733 (for C-band systems).

The system instruction book contains a general description and theory of system operation, system installation instructions, and operating procedures.

1-2. FUNCTION OF EQUIPMENT.

The control units and conversion kit described below function to provide remote control of the radar system from a location in the aircraft's cockpit convenient to the pilot and/or copilot.

1-3. DESCRIPTION OF EQUIPMENT.

a. GENERAL.--Each type CON-1( ) Control is different from all other types in size, control functions, panel layout, connector type, weight, or a combination of the differences listed. Table 1-1 is a reference chart to illustrations and tables which show or list the characteristics of each type CON-1( ) Control.

b. ELECTRICAL.--All models of the CON-1( ) Control, except the CON-1K Conversion Kit, as described in paragraph 1-3d, are equipped with the BENDIX DA-NITE system of panel illumination which presents white numerals and markings in daylight, and red illuminated numerals and markings at night. All electrical connections to the CON-1( ) Control are made through connector plug P5001 on the rear of the unit.

The electrical system of the CON-1( ) Control includes controls for the functions listed in table 1-2.

All manual controls are available as switches or control knobs on the front panel.

The CON-1( ) Control requires primary power of 28 volts dc at 0.87 amperes maximum for panel lighting and system control.

c. MECHANICAL.--The CON-1( ) Control is composed of a small all-aluminum chassis, a Plexiglas front panel, an aluminum dust cover, an electrical connector on the rear, essential electrical components as described in section II, panel lamps, and control knobs.

TABLE 1-1. REFERENCE CHART, CON-1( ) CONTROL TYPE DIFFERENCES

TYPE CON-1 ( )	WEIGHT (Pounds)	(See Figure or Table Listed)				CONNECTOR P5001 (Cannon type)
		SIZE (Figure)	PANEL LAYOUT (Figure)	CONTROL FUNCTIONS (Table)	SCHEMATIC DIAGRAM (Figure)	
A	2.25	3-1	9-11	1-2	9-1	DC-37P
B	2.25	3-1	9-11	1-2	9-2	DC-37P
D	2.25	3-1	9-11	1-2	9-3	DC-37P
G	2.25	3-2	9-11	1-2	9-4	K02-21-30PN
J	2.1	3-3	*	1-2	9-5	K02-21-30PN
L-1	1.5	3-5	9-12	1-2	9-6	K02-21-30PN
L-2	1.5	3-5	9-12	1-2	9-6	K02-21-30PN
L-3	1.5	3-5	9-12	1-2	9-6	K02-21-30PN
L-4	1.5	3-5	9-12	1-2	9-6	K02-21-30PN
M	2.25	3-6	9-11	1-2	9-7	K02-21-30PN

*Same as CON-1L-1 except panel size.

TABLE 1-2. FUNCTIONS CONTROLLED BY TYPE CON-1( ) CONTROLS

FUNCTION	CONTROL TYPES CON-1( )									
	A	B	D	G	J	L-1	L-2	L-3	L-4	M
OFF-STANDBY-ON	X	X	X	X	X	X	X	X	X	X
CONTOUR ON-OFF	X	X	X	X	X	X	X	X	X	X
I-F GAIN	X	X	X	X	X	X	X	X	X	X
DIMMER, PANEL LAMP	X	X	X	X	X	X	X	X	X	X
ANTENNA TILT	X	X	X	X	X	X	X	X	X	X
MAPPING			X	X	X	X			X	
BEACON		X	X	X	X	X		X		

d. CON-1K CONVERSION KIT.--The CON-1K Conversion Kit is available for custom installation where the use of a regular control box unit would not be consistent with the aircraft's control panel plan, or where the lack of mounting space prevents the installation of a control box as a unit

The kit can be used with either C-band or X-band systems but must be complemented by suitable additional switches for the control of those functions of the system for which no switch is provided in the kit. The CON-1K Conversion Kit consists of the components shown and listed in figure 3-4. Components of the kit weigh one pound; mounting dimensions are given in figure 3-4.

1-4. EQUIPMENT SUPPLIED.

The equipment supplied as a type CON-1( ) Control is listed in table 1-3.

TABLE 1-3. EQUIPMENT SUPPLIED

TYPE NUMBER	NAME OF EQUIPMENT
CON-1( )	Control

1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

All other equipment and accessories required for the installation and operation of a CON-1( ) Control as a system component are listed in section I of the system instruction book except as noted below.

On control unit types CON-1G, CON-1J, CON-1L( ), and CON-1M, plug P5001 is a Cannon type K02-21-30PN (Bendix part number A287304-3) which mates with jack J6501, a Cannon type K03-21-30SN connector with type K06, K08, or K45 end bells. Jack J6501 and end bells are not supplied as part of the type CON-1( ) Control.

Refer to section III of the system instruction book for equipment required for use with type CON-1K Conversion Kit.

SECTION II
THEORY OF OPERATION

2-1. GENERAL.

Remote control of the Bendix type RDR-1 Airborne Radar System is accomplished by means of controls available on the CON-1( ) Control unit.

The sequential operation of the radar set's control system, and circuit changes throughout the radar system initiated as a result of different settings of the controls on the CON-1( ), can be noted by referring to the following diagrams:

1. Simplified schematic diagram of the radar set's control system (figure 2-7 of system instruction book I.B. 732 for X-band systems or I.B. 733 for C-band systems).

2. Sequential operation chart of the control system (figure 2-8 of system instruction book).

3. Control system supplemental functions operation chart (figure 2-9 of X-band system instruction book I.B. 732).

2-2. FUNCTIONS.

a. GENERAL.--See the schematic diagram of the CON-1( ) Control type under consideration (figures 9-1 through 9-7 to follow the circuit theory given below).

On type CON-1A, CON-1B, and CON-1D Controls the pin terminals of connector plug P5001 are designated by numbers. On type CON-1G, CON-1J, CON-1L-( ), and CON-1M Controls, the pin terminals of connector plug P5001 are designated by letters. The pin terminal numbers and letters are correlated as shown in table 2-1.

TABLE 2-1. CORRELATION OF NUMBERED AND LETTERED PIN TERMINAL DESIGNATIONS ON CONNECTOR PLUGS P5001

FUNCTION	CONNECTOR PLUG P5001 TYPE DC-37-P	CONNECTOR PLUG P5001 TYPE K02-21-30PN
28 VDC IN	Pin 1	Pin A
GROUND	9	B
STAND-BY	2	C
ON CONTROL	3	D
BEACON	5	E
CONTOUR	4	F
28 VDC LAMPS	14	H
TILT SYNCHRO ROTOR	10	L
	11	M
TILT SYNCHRO STATORS	25	R
	24	S
	26	T
STC DISABLE	22	U
CONTOUR TEST	--	a
MAP	29	b
SHIELD GROUND	27	d
I-F GAIN	17	f
SHIELD GROUND	16	g
GAIN GROUND RETURN	18	i

b. SWITCHING CONTROLS.--The switches on CON-1( ) Controls afford remote control of the radar set by switching 28 volts dc, as required, to the control system of the several major units comprising the radar set. Functions controlled by the switches include off-stand-by-on attitudes of the radar, contour on-off, map on-off, and beacon on-off.

Rotary switch S5001, used on types CON-1A, CON-1B, CON-1D, CON-1G, and CON-1M Controls, is a special single-pole three-position rotary wafer switch

which controls the off-stand-by-on attitudes of the radar. All other switching functions in these models are handled by toggle switches.

Rotary switch S5001, used on types CON-1J and CON-1L-( ) Controls, is a special rotary wafer switch which handles all switching functions assigned to the CON-1( ) Control, eliminating all toggle switches.

Figures 9-11 and 9-12 show the functions handled by each type CON-1( ) Control and the physical layout of the controls on the front panel.

c. DIFFERENCES IN SWITCHING CIRCUITS.

(1) TYPE CON-1A CONTROL.--The Type CON-1A Control (figure 9-1) employs a rotary wafer switch for off-stand-by-on functions and a single-pole single-throw toggle switch for contour on-off functions. The 28-volt d-c control voltage is applied to contour on-off switch S5002 only when the off-stand-by-on switch S5001 is in "ST'BY" or "ON" position; therefore, switch S5002 has no effect on the radar when switch S5001 is in the "OFF" position.

(2) CON-1B CONTROL.--The type CON-1B Control (figure 9-2) employs a rotary wafer switch for off-stand-by-on functions, a single-pole single-throw toggle switch for contour on-off, and a single-pole single-throw toggle switch for beacon on-off functions. The 28-volt d-c control voltage is applied to contour on-off switch S5002 and to beacon on-off switch S5003 only when the off-stand-by-on switch S5001 is in "ST'BY" or "ON" position; therefore, switches S5002 and S5003 have no effect on the radar when switch S5001 is in "OFF" position.

(3) CON-1D CONTROL.--The type CON-1D Control (figure 9-3) employs a rotary wafer switch for off-stand-by-on; a double-pole double-throw toggle switch with neutral center position for contour on-off, map on-off, and STC (sensitivity time control) disabling; and a single-pole double-throw toggle switch for beacon on-off functions. The 28-volt d-c control voltage is applied to the center (arm) contack of beacon on-off switch S5003 only when the off-stand-by-on switch S5001 is in "ON" position; therefore, switch S5003 has no effect on the radar when switch S5001

is in either "OFF" or "ST'BY" positions. The 28-volt d-c control voltage is applied to contour-map switch S5002 only when off-stand-by-on switch S5001 is in "ON" position and beacon on-off switch S5003 is in "OFF" position. This switch interlocking arrangement prevents the energizing of beacon and contour control relays in the transmitter and the mapping (ferrite magnetizing) coil in the antenna unless switch S5001 is in "ON" position, and then allows only one of the other three functions (beacon, contour, and map) to be energized at any one time. Contour-map switch S5002 also disables the STC circuit in the receiver when switch S5002 is in "MAP" position.

(4) CON-1G CONTROL.--The type CON-1G Control (figure 9-4) has the same switching components and circuits as the type CON-1D Control. Refer to paragraph 2-2c(3).

(5) CON-1J CONTROL.--The CON-1J Control (figure 9-5) employs one rotary wafer switch S5001 for all switching functions which include off-stand-by-on, contour, map, beacon, and STC disable. The control circuits closed for each position of control switch S5001 are shown in table 2-2.

TABLE 2-2. CONTROL CIRCUITS CLOSED BY CONTROL SWITCH S5001

SWITCH POSITION	CLOSED CIRCUITS (= X)					
	ST'BY	ON (NOR)	CONTOUR	MAP	BEACON	STC DISABLE
OFF	-	-	-	-	-	-
ST'BY	X	-	-	-	-	-
ON (NOR)	X	X	-	-	-	-
CONTOUR	X	X	X	-	-	-
MAP	X	X	-	X	-	X
BEACON	X	X	-	-	X	-

(6) CON-1K CONVERSION KIT.--The CON-1K Conversion Kit (figure 3-4) contains a single-pole three-position rotary wafer switch to handle the off-stand-by-on functions of the radar only. Refer to paragraph 1-3d and figure 3-4 for complete data.

(7) CON-1L-1CONTROL.--The CON-1L-1 Control (figure 9-6) has the same switching components and circuits as the type CON-1J Control. Refer to paragraph 2-2c(5). Table 2-2 shows the circuits closed for each position of control switch S5001.

(8) CON-1L-2CONTROL.--The CON-1L-2 Control (figure 9-6) is the same as the CON-1L-1 Control except it does not provide for map and beacon functions.

(9) CON-1L-3 CONTROL.--The CON-1L-3 Control (figure 9-6) is the same as the type CON-1L-1 Control except it does not provide for the map function.

(10) CON-1L-4 CONTROL.--The CON-1L-4 Control (figure 9-6) is the same as the type CON-1L-1 Control except it does not provide for the beacon function.

(11) CON-1M CONTROL.--The CON-1M Control (figure 9-7) has the same switching components and circuits as the type CON-1A Control. Refer to paragraph 2-2c(1).

d. CIRCUIT ADJUSTING CONTROLS.--All CON-1( ) Controls are equipped with a gain control and a dimmer control.

(1) GAIN CONTROL.--The gain control consists of a 2500-ohm potentiometer (R5001) and a control knob. This control affords remote control of receiver gain by allowing the operator to alter the grid bias on gain controlled i-f amplifier tubes in the receiver section of the RDR-1( ) Transmitter-Receiver unit.

(2) DIMMER CONTROL.--The dimmer control consists of a 500-ohm potentiometer (R5002) and a control knob. This control affords manual adjustment of CON-1( ) Control panel lamp brilliance.

e. ANTENNA TILT CONTROL.--All CON-1( ) Controls are equipped with an antenna tilt control consisting of tilt control transformer synchro B5001, a control

knob, essential gearing, and a calibrated degree-of-tilt scale inscribed on the front panel of the CON-1( ) Control.

The antenna tilt control affords remote control of the radiation angle of the beam radiated by the antenna.

Rotation of the "ANT-TILT" control knob to indicate other than "0" degree will cause the beam radiated by the antenna to be radiated at an angle above or below the horizontal plane to the degree indicated on the degree-of-tilt scale inscribed on the front panel of the CON-1( ) Control.

The antenna tilt control is a part of the radar set's servo system. Its theory of operation is covered in the system instruction book.

SECTION III
INSTALLATION

3-1. GENERAL.

This section contains information and illustrations designed to facilitate the installation of a Bendix type CON-1( ) Control or CON-1K Conversion Kit.

The control unit will ordinarily be used by both the pilot and copilot and should be installed in the cockpit of the aircraft in a position convenient to both operators.

Shockmounting is not required and ventilation is not important.

The total mounting space required can be determined from the dimensional outline drawing of the particular type CON-1( ) unit to be installed. See figures 3-1 through 3-6.

3-2. CON-1( ) CONTROL INSTALLATION.

a. MOUNTING.--The CON-1( ) Control is designed for panel mounting and uses four screwdriver-operated Dzus fasteners to secure the unit to the panel in the aircraft.

b. ELECTRICAL CONNECTIONS.--All electrical connections to the CON-1( ) Control are made through connector plug P5001 on the rear of the control unit. Connector plug P5001 mates with jack J6501 in the aircraft wiring installation. Refer to the system wiring diagram in the system instruction book for interconnection data.

For types CON-1A, CON-1B, and CON-1D Controls, mating jack J6501 must be a type DC-37-S Cannon connector.

For types CON-1G, CON-1J, CON-1L-( ), and CON-1M Controls, mating jack J6501 must be a type K02-21-30SN connector.

3-3. CON-1K CONVERSION KIT INSTALLATION.

a. MOUNTING.--Figure 3-4 lists the parts included in the CON-1K Conversion Kit, shows mounting dimensions, and includes a detail drawing of the panel calibrations required for the antenna tilt control.

The parts need not occupy the relative positions shown in figure 3-4 but can be installed in available space convenient to the operators.

Additional function switches must be added as required.

b. ELECTRICAL CONNECTIONS.--All electrical connections must be made in accordance with those shown in the schematic diagram of the type CON-1( ) Control the conversion kit replaces. Interconnections must follow those shown in the system interconnecting wiring diagram in the system instruction book.

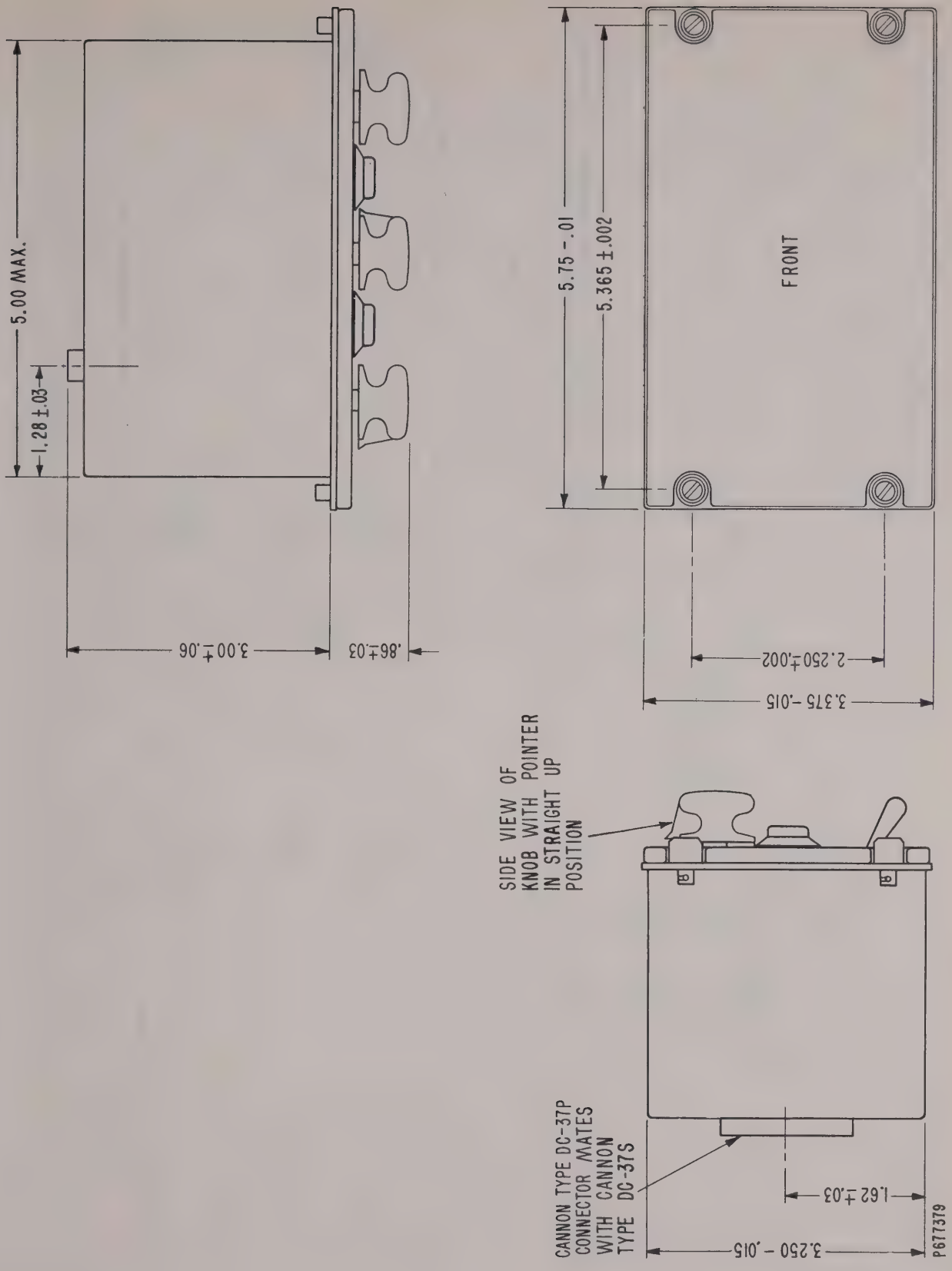


Figure 3-1. Type CON-1A, CON-1B, and CON-1D Controls, Dimensional Outline Drawing

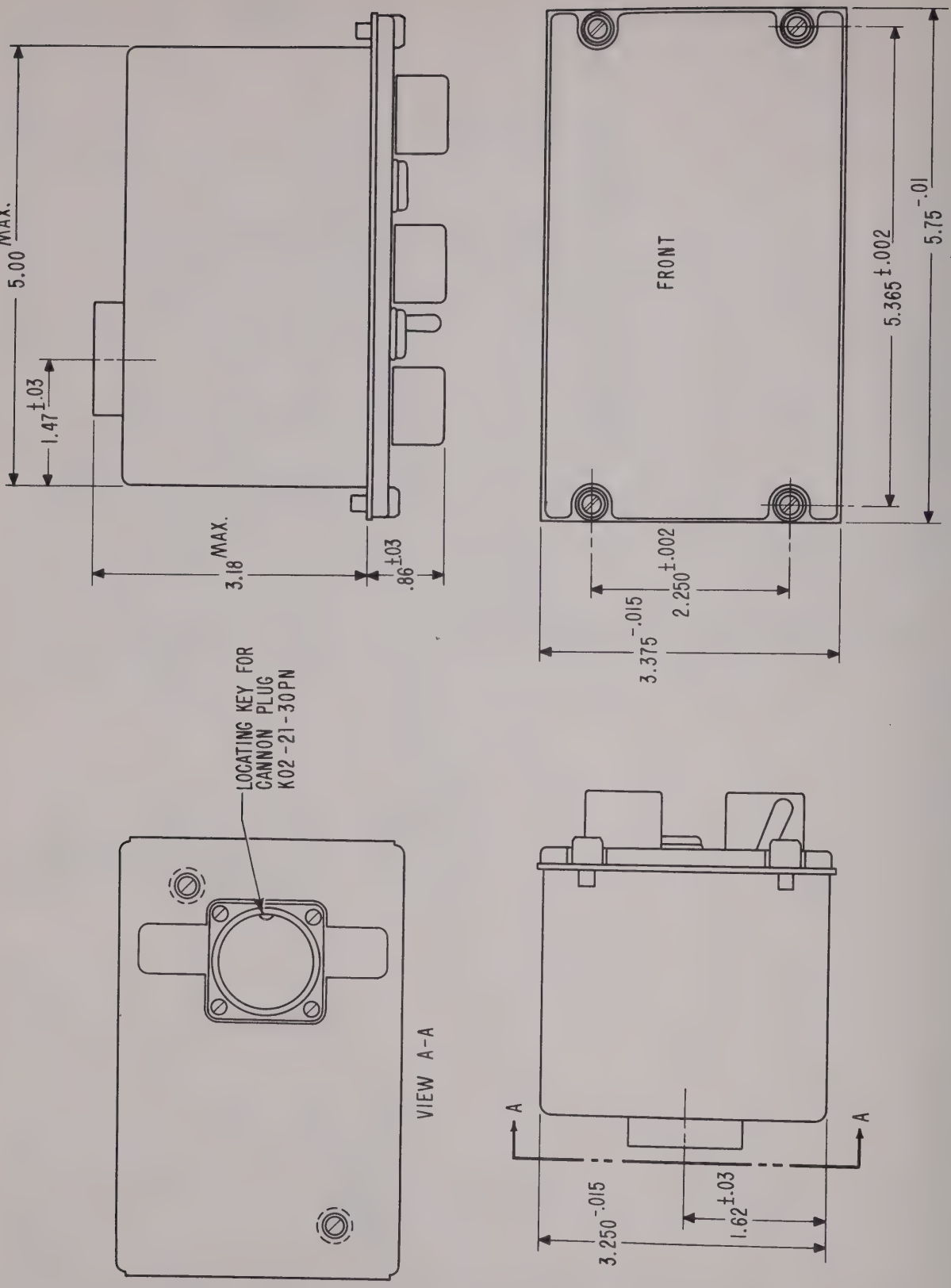


Figure 3-2. Type CON-1G, CON-1M Controls, Dimensional Outline Drawing

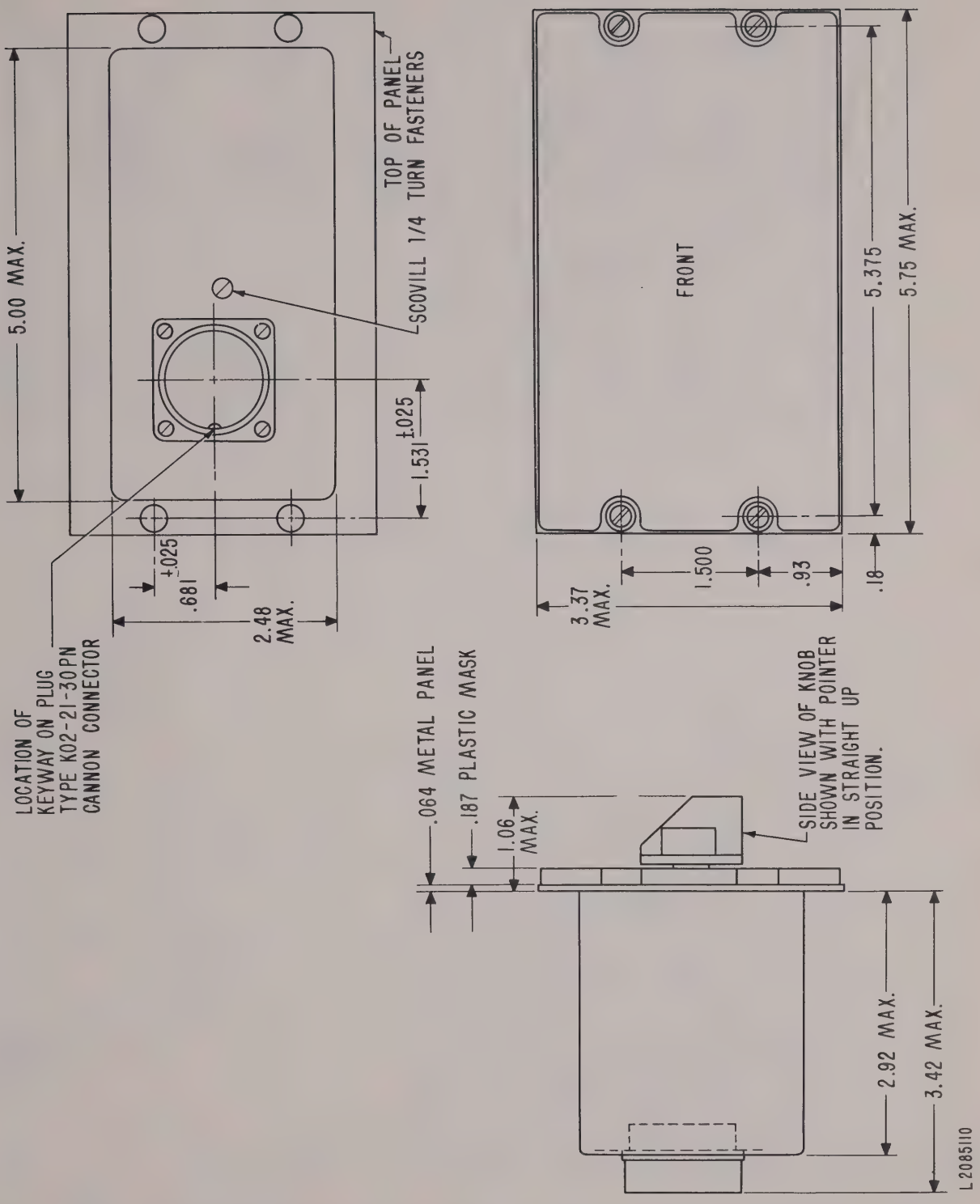
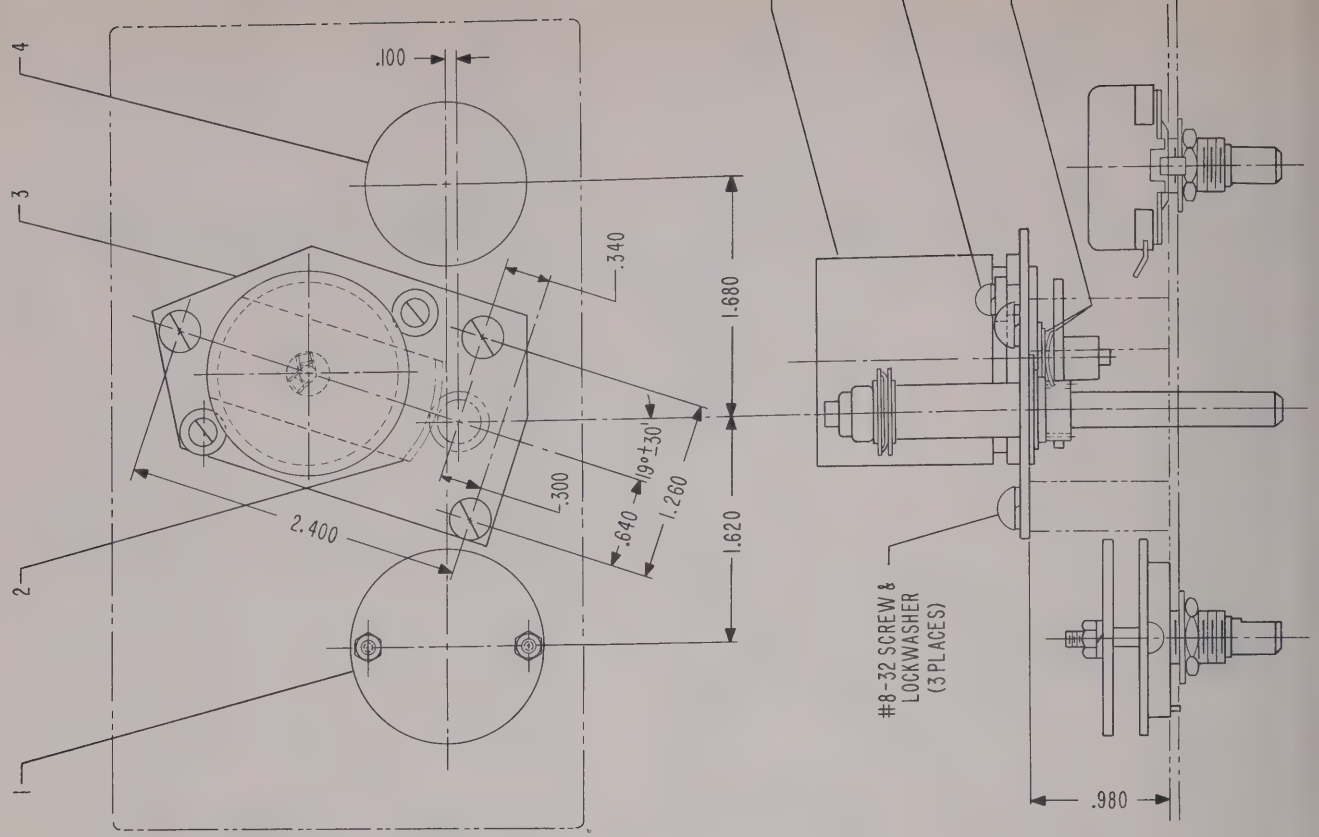
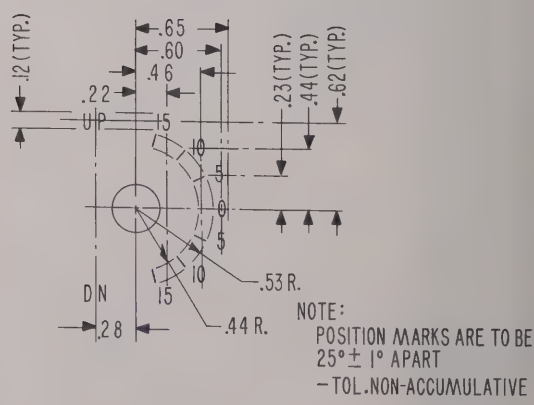


Figure 3-3. Type CON-1J Control, Dimensional Outline Drawing



ITEM	SYMBOL NUMBER	BENDIX PART NUMBER	NAME OF PART	QUANTITY PER UNIT
1	S5001	C218385-66	SWITCH, SP3POS ROTARY WAFER	1
2	-	C282768-1	GEAR ASSEMBLY	1
3	-	N282767-1	MOUNTING ASSEMBLY	1
4	R5001	ERV30GR2U-252	POTENTIOMETER, 2500 OHMS	1
7	B5001	C220908-1	SYNCHRO, TILT CONTROL TRANSFORMER	1
8	-	HC949B10-632	SCREW, RH	2
9	-	HC799P06-M	WASHER, LOCK SPLIT	2
10	-	C237804-3	BUSHING, SYNCHRO CLAMP	2
11	-	HSP779R-0010	WASHER, FLAT	1
12	-	OA17027-90	WASHER, SPRING	1

N283382



NOTES:
1. USE HARDWARE SUPPLIED WITH PART.

Figure 3-4. Type CON-1K Conversion Kit, Mounting Dimensions, Panel Layout, and Parts List

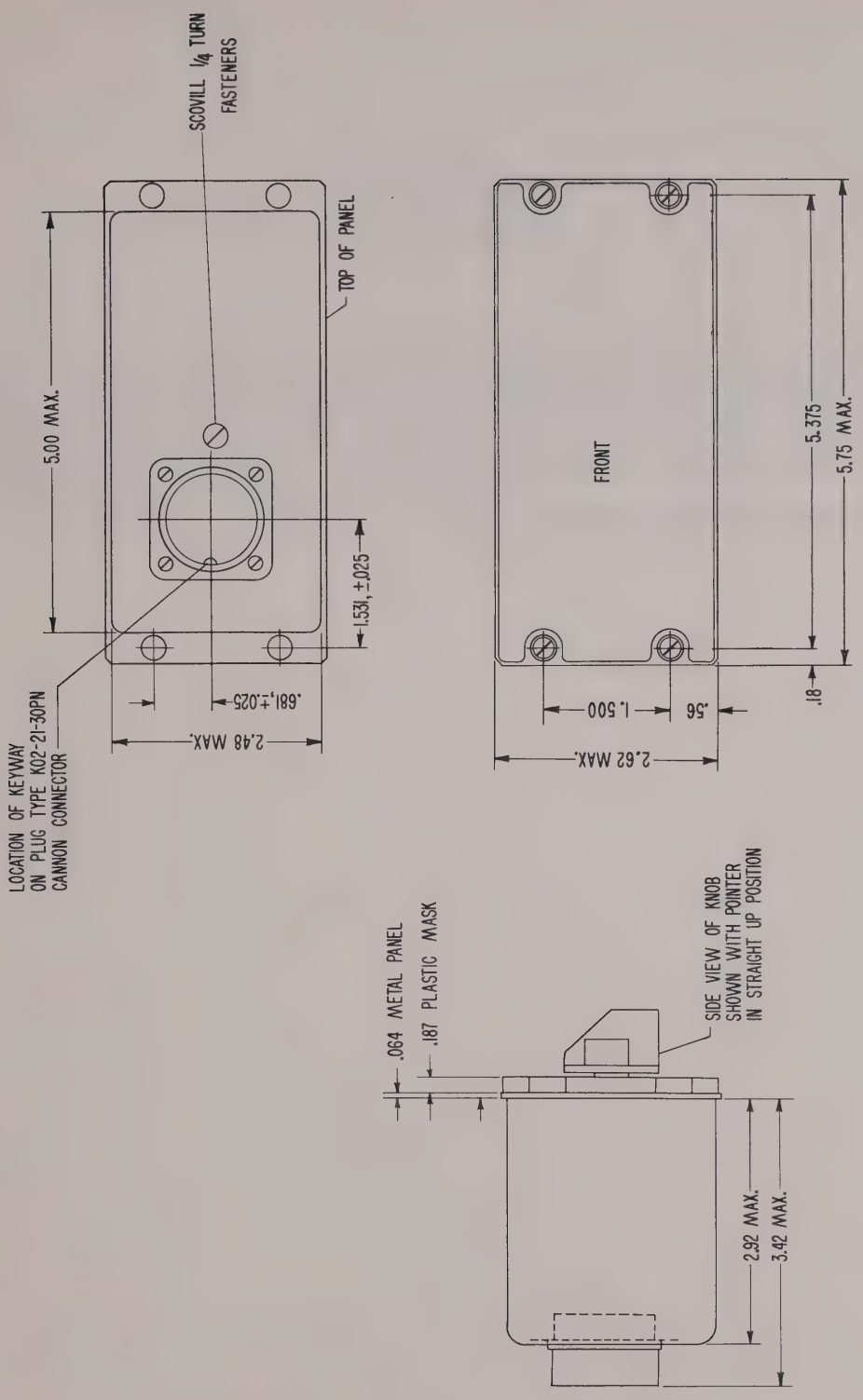


Figure 3-5. Type CON-1L-( ) Controls, Dimensional Outline Drawing

SECTION IV
OPERATION

4-1. GENERAL.

The operation of all of the control units described in this handbook involves the operation of the radar set with which it is used. Complete operating procedures are given in section IV of the RDR-1 Airborne Radar System Instruction Book I. B. 732 for X-band systems and Instruction Book I. B. 733 for C-band systems.

SECTION V
PREVENTIVE MAINTENANCE

5-1. GENERAL.

The control units described in this handbook are components of the RDR-1 Airborne Radar System. The preventive maintenance procedures as outlined in section V of Instruction Book I.B. 732 for X-band systems or Instruction Book I.B. 733 for C-band systems should be followed.

SECTION VI
CORRECTIVE MAINTENANCE

6-1. GENERAL.

This section contains information essential to the maintenance and overhaul of the CON-1( ) Control and the CON-1K Conversion Kit.

If any unusual or special problems arise, it is suggested that the Service Department, Bendix Radio Division of Bendix Aviation Corporation, Baltimore 4, Maryland be contacted for advice or assistance.

Should it be necessary to ship units to the factory or between operating points, pack the units in a substantial case made of plywood or equivalently strong material, with braces and felt padding, for shipping.

No equipments should be returned to the factory until a return authorization (RA) form is requested and received from the Service Department of Bendix Radio.

Maintenance, test, and alignment procedures are essentially the same for all CON-1( ) types and the data given in this section apply equally to all types except as specifically noted.

All CON-1( ) Controls and the CON-1K Conversion Kit include a tilt control transformer synchro B5001 which must be mechanically aligned at electrical zero. This alignment is necessary to provide accurate control of the antenna tilt angle. Two alignment procedures are given. The first procedure requires the test jig shown schematically in figure 6-1. The second (alternate) procedure does not require the test jig but does require a wired connector as shown in figure 6-2.

A continuity test is the only other test required to prove the control units electrically.

6-2. TEST EQUIPMENT REQUIRED.

Table 6-1 is a list of test equipment required for test and alignment of type CON-1( ) Controls.

TABLE 6-1. TEST EQUIPMENT REQUIRED FOR CON-1( ) CONTROLS

Schematic diagram of CON-1( ) Control type under test	(Figures 9-1 thru 9-7)
Ohmmeter, Triplett, model 630 or equivalent	
VTVM, Ballantine, model 310 or equivalent	
Test jig for synchro alignment	(Figure 6-1)
or	
Wired connector type	
DC-37-S for type CON-1A, B, and D Controls	(Figure 6-2)
K02-21-30SN for type CON-1G, J, L-( ), and M Controls	(Figure 6-2)
Power supply, 26 volts, 400 cps	

The test jig, shown schematically in figure 6-1, is optional and must be fabricated by the using organization. It must be equipped with the connector type (J1 or J2) as specified in notes 1 and 2 of figure 6-1. If both types of connectors are wired to the test jig, it can be used with all types of CON-1( ) Controls.

6-3. TEST AND ALIGNMENT PROCEDURES.

a. GENERAL. --See the schematic diagram of the type CON-1( ) Control under test.

Use table 6-2 for continuity test of type CON-1A, CON-1B, and CON-1D Controls.

Use table 6-3 for continuity test of type CON-1G and CON-1M Controls.

Use table 6-4 for continuity test of type CON-1J and CON-1L-( ) Controls.

Follow procedure under paragraph 6-3c for synchro alignment using test jig method.

Follow procedure under paragraph 6-3d for synchro alignment using alternate method (without test jig).

b. CONTINUITY TEST PROCEDURES.

TABLE 6-2. CONTINUITY TEST OF TYPES CON-1A, B, AND D CONTROLS

Conditions: Before starting continuity test, establish the following initial control settings.

CONTROL	SYMBOL	UNIT TYPE CON-1( )	CONTROL POSITION
OFF-ST'BY-ON	S5001	(A - B - D)	OFF
CONTOUR	S5002	(A - B - -)	OFF
CONTOUR-MAP	S5002	(- - - - D)	Neutral-center
BEACON	S5003	(- - B - D)	OFF
I-F GAIN	R5001	(A - B - D)	Fully counterclockwise
DIMMER	R5002	(A - B - D)	Fully counterclockwise
ANT-TILT	B5001	(A - B - D)	Any setting

Tests must be performed in the numerical and alphabetical order shown for complete results. For successive tests, leave control or switch in its last previous setting and make changes only as called for.

TEST NUMBER	UNIT TYPE CON-1( )	CONTROL AND SYMBOL NO.	POSITION	PLUG P5001		OHM-METER READING
				FROM PIN	TO PIN	
1 - a	(A-B-D)	S5001 OFF-ST'BY-ON	OFF	1	2	Open
- b			OFF	1	3	Open
- c			ST'BY	1	2	Short
- d			ST'BY	1	3	Open
- e			ON	1	2	Short
- f			ON	1	3	Short
- g			ON	1	Ground	Open

TABLE 6-2. CONTINUITY TEST OF TYPES CON-1A, B, AND D CONTROLS (Continued)

TEST NUMBER	UNIT TYPE CON-1( )	CONTROL AND SYMBOL NO.	POSITION	PLUG P5001		OHMMETER READING
				FROM PIN	TO PIN	
2 - a	(A-B)	S5002 CONTOUR	OFF	1	4	Open
- b			ON	1	4	Short
3 - a	(D)	S5003 CONTOUR-MAP	Neutral-center	1	4	Open
- b			CONTOUR	1	4	Short
- c				1	29	Open
- d				22	Ground	Open
- e			MAP	1	4	Open
- f				1	29	Short
- g				22	Ground	Short
4 - a	(B-D)	S5003 BEACON	OFF	1	5	Open
- b			ON	1	5	Short
5 - a	(D)			1	29	Open
- b				1	4	Open
6 - a	(A-B-D)			10	11	40 ohms
- b				10	Ground	Open
- c				26	24	10 ohms
- d				26	25	10 ohms
- e				26	Ground	Open
7 - a	(A-B-D)	R5001 I-F GAIN	Counter-clockwise to clock-wise	17	18	2500-0 ohms
- b				17	Ground	Open
8 - a	(A-B-D)			9	Ground	Short
- b				27	Ground	Short
- c				16	Ground	Short
9 - a	(A-B-D)	R5002 DIMMER	Counter-clockwise to clock-wise	14	Ground	575-75 ohms

Switches and controls associated with the CON-1K Conversion Kit must be tested in accordance with the above conditions.

TABLE 6-3. CONTINUITY TEST OF TYPES CON-1G AND M CONTROLS

Conditions: Before starting continuity test, establish the following initial control settings.

CONTROL	SYMBOL	UNIT TYPE CON-1( )	CONTROL POSITION
OFF-ST'BY-ON	S5001	(G - M)	OFF
CONTOUR	S5002	(- - M)	OFF
CONTOUR-MAP	S5002	(G - -)	Neutral-center
BEACON	S5003	(G - -)	OFF
I-F GAIN	R5001	(G - M)	Fully counterclockwise
DIMMER	R5002	(G - M)	Fully counterclockwise
ANT-TILT	B5001	(G - M)	Any setting

Tests must be performed in the numerical and alphabetical order shown for complete results. For successive tests, leave control or switch in its last previous setting and make changes only as called for.

TEST NUMBER	UNIT TYPE CON-1( )	CONTROL AND SYMBOL NO.	POSITION	PLUG P5001		OHMMETER READING
				FROM PIN	TO PIN	
1 - a	(G-M)	S5001 OFF-ST'BY-ON	OFF	A	C	Open
- b			OFF	A	D	Open
- c			ST'BY	A	C	Short
- d			ST'BY	A	D	Open
- e			ON	A	C	Short
- f			ON	A	D	Short
- g			ON	A	Ground	Open
2 - a	(M)	S5002 CONTOUR	OFF	A	F	Open
- b			ON	A	F	Short
3 - a	(G)	S5003 CONTOUR-MAP	Neutral-center	A	F	Open
- b			CONTOUR	A	F	Short
- c				A	b	Open
- d				U	Ground	Open
- e			MAP	A	F	Open
- f				A	b	Short
- g				U	Ground	Short
4 - a	(G)	S5003 BEACON	OFF	A	E	Open
- b			ON	A	E	Short
- c				A	b	Open
- d				A	F	Open

TABLE 6-3. CONTINUITY TEST OF TYPES CON-1G AND M CONTROLS (Continued)

TEST NUMBER	UNIT TYPE CON-1( )	CONTROL AND SYMBOL NO.	POSITION	PLUG P5001		OHMMETER READING
				FROM PIN	TO PIN	
5 - a	(G-M)			L	M	40 ohms
- b				L	Ground	Open
- c				T	S	10 ohms
- d				T	R	10 ohms
- e				T	Ground	Open
6 - a	(G-M)	R5001 I-F GAIN	Counter-clockwise to clock-wise	f	i	2500-0 ohms
- b				f	Ground	Open
7 - a	(G-M)			B	Ground	Short
- b				d	Ground	Short
- c				g	Ground	Short
9 - a	(G-M)	R5002 DIMMER	Counter-clockwise to clock-wise	H	Ground	575-75 ohms

TABLE 6-4. CONTINUITY TEST OF TYPES CON-1J, 1L-1, 1L-2, 1L-3, AND 1L-4 CONTROLS

Conditions: Before starting continuity tests, establish the following initial control settings.

CONTROL	SYMBOL	UNIT TYPE CON-1( )	CONTROL POSITION
FUNCTION SWITCH	S5001	All	OFF
I-F GAIN	R5001	All	Fully counterclockwise
DIMMER	R5002	All	Fully counterclockwise
ANT-TILT	B5001	All	Any setting

TABLE 6-4. CONTINUITY TEST OF TYPES CON-1J, 1L-1, 1L-2, 1L-3, AND 1L-4 CONTROLS (Continued)

Tests must be performed in the numerical and alphabetical order shown for complete results. For successive tests, leave control or switch in its last previous setting and make changes only as called for.

TEST NUMBER	UNIT TYPE CON-1( )	CONTROL AND SYMBOL NO.	POSITION	PLUG P5001		OHMMETER READING
				FROM PIN	TO PIN	
1 - a	(All)	SWITCH S5001	OFF	A	C	Open
- b				A	D	Open
- c				A	Ground	Open
2 - a	(All)		ST'BY	A	C	Short
- b				A	D	Open
3 - a	(All)		NOR (on)	A	C	Short
- b				A	D	Short
- c				A	F	Open
- d				A	b	Open
- e				A	E	Open
4 - a	(All)		CTR (contour)	A	C	Short
- b				A	D	Short
- c				A	F	Short
5 - a	(J, L-1, L-4)		MAP	A	C	Short
- b				A	D	Short
- c				A	F	Open
- d				A	b	Short
- e				U	Ground	Short
6 - a	(J, L-1, L-3)		BCN (beacon)	A	C	Short
- b				A	D	Short
- c				A	F	Open
- d				A	b	Open
- e				A	E	Short
- f				U	Ground	Open
7 - a	(All)	R5001 I-F GAIN	Counter-clockwise to clock-wise	f	i	2500-0 ohms
- b				f	Ground	Open

TABLE 6-4. CONTINUITY TEST OF TYPES CON-1J, 1L-1, 1L-2, 1L-3, AND 1L-4 CONTROLS (Continued)

TEST NUMBER	UNIT TYPE CON-1( )	CONTROL AND SYMBOL NO.	POSITION	PLUG P5001		OHM-METER READING
				FROM PIN	TO PIN	
8 - a	(All)			g	Gnd.	Short
- b				B	Gnd.	Short
- c				d	Gnd.	Short
9 - a	(All)	R5002 DIMMER	Counter-clockwise to clock-wise	H	Gnd.	575-75 ohms
10 - a	(All)			L	M	40 ohms
- b				S	T	10 ohms
- c				R	T	10 ohms
- d				T	Gnd.	Open
- e				L	Gnd.	Open

c. TILT CONTROL TRANSFORMER SYNCHRO B5001 ALIGNMENT PROCEDURE (TEST JIG METHOD).--Use of the test jig (figure 6-1) for alignment (zeroing) of tilt control transformer B5001 requires a primary source of 26 volts, 400 cps.

Step 1. Place test jig switch S1 in "OFF" position, S2 in center-neutral position.

Step 2. Connect 26 volts, 400 cps to the input terminals of test jig.

Step 3. Connect an a-c vtvm to "BP1" terminals of test jig.

Step 4. Remove dust cover from CON-1( ) Control.

Step 5. Connect CON-1( ) Control to test jig jack J1 or J2 as required.

Step 6. Set "ANT-TILT" control knob to an indicated "0" degree tilt and check that this is the center of travel knob. Refer to paragraph 6-4c for knob alignment.

Step 7. Loosen the two screws securing the bushings that clamp the synchro flange. Loosen screws only enough to permit the synchro case to be turned in its mount by hand.

Step 8. Place test jig switch S2 in "PHASE ADJUST" (A) position.

Step 9. Close test jig switch S1.

CAUTION

Leave test jig switch S1 closed only long enough to make adjustment indicated in step 10. Prolonged application of power to synchro thus connected may damage unit.

Step 10. Rotate case of tilt control transformer synchro B5001 to obtain a maximum reading on vtvm of about 20 volts.

NOTE

A higher maximum is obtainable, but the 20-volt maximum establishes the correct rotor-stator phase relationship.

Step 11. Place test jig switch S2 in the "ZERO ADJUST" (B) position.

Step 12. Close test jig switch S1.

CAUTION

Leave test jig switch S1 closed only long enough to make adjustment indicated in step 13.

Step 13. Carefully rotate synchro case for a null indication on vtvm, using lowest possible voltmeter scale. Note final meter reading.

Step 14. Tighten the two synchro retaining screws.

Step 15. Recheck to see that "ANT-TILT" control knob is still indicating "0" degree tilt as established in step 6.

Step 16. Recheck to see that the same null reading is obtained as noted in step 13.

Step 17. Place test jig switch S1 in "OFF" position, S2 in center-neutral position.

Step 18. Disconnect unit under test from test jig and replace dust cover.

d. TILT CONTROL TRANSFORMER SYNCHRO B5001 ALIGNMENT PROCEDURE (ALTERNATE METHOD).--When using this (alternate) alignment procedure, the test jig is not required. A primary source of 26 volts, 400 cps is required.

A connector, wired with leads approximately 12 inches long as shown in figure 6-2, facilitates the electrical connections to the synchro. Note that the red, black, and blue leads to connector J1 or J2 (figure 6-2) are stator leads; the yellow and white leads are rotor leads. This color coding conforms to the color coding of wires from the synchro except that the white lead to connector J1 or J2 represents the synchro rotor black lead. A white lead is used to pin 26 of connector J1 and to pin T of connector J2 to eliminate confusion between the synchro stator black lead and the synchro rotor black lead.

Use connector J1 (type DC-37-S) for type CON-1A, -1B, and -1D Controls.

Use connector J2 (type K03-21-30SN) for type CON-1G, -1J, -1L( ), and -1M Controls.

NOTE

Connector J1 or J2 is not needed when aligning the synchro installed as part of the CON-1K Conversion Kit; simply follow the procedure as given, making connections directly to the synchro leads and observe wire color coding.

Step 1. Remove dust cover from CON-1( ) Control.

Step 2. Mate wired connector (J1 or J2 as required) with connector P5001 on CON-1( ) Control.

Step 3. Loosen the two screws securing the bushings that clamp the synchro flange. Loosen screws only enough to permit the synchro case to be turned in its mount by hand.

Step 4. Set "ANT-TILT" control knob to an indicated "0" degree tilt and check that this is the center of travel of knob. Refer to paragraph 6-4c for knob alignment.

Step 5. Make connections as in A or C of figure 6-2 for phase adjustment.

CAUTION

Apply power only long enough to make adjustment indicated in step 6. Prolonged application of power may damage unit.

Step 6. With power applied, rotate case of synchro B5001 to obtain a maximum reading on vtvm of about 20 volts.

NOTE

A higher maximum is obtainable, but the 20-volt maximum establishes the correct rotor-stator phase relationship.

Step 7. Change connections to those shown in B or D of figure 6-2.

CAUTION

Apply power only long enough to make adjustment indicated in step 8.

Step 8. With power applied, carefully rotate case of synchro B5001 for a null indication on vtvm using lowest possible voltmeter scale. Note final meter reading.

Step 9. Tighten synchro retaining screws.

Step 10. Recheck to see that "ANT-TILT" control knob is still indicating "0" degree tilt as established in step 4.

Step 11. Recheck to see that same null reading is obtained as noted in step 8.

Step 12. Disconnect power. Disconnect connector J1 or J2 from CON-1( ) Control and replace dust cover.

6-4. REMOVAL, DISASSEMBLY, REASSEMBLY, AND ADJUSTMENT OF MOUNTING PLATE, SYNCHRO, AND GEAR DRIVE ASSEMBLY.

a. GENERAL.--On type CON-1A, CON-1B, CON-1D, CON-1G, and CON-1M Controls, the "ANT-TILT" control knob points to the right-hand side of the control panel when set for "0" degree tilt. See figure 7-1.

On CON-1J and CON-1L-( ) Controls the "ANT-TILT" control knob points to the left-hand side of the control panel when set for "0" degree tilt. See figure 7-2.

The "ANT-TILT" control knob must be adjusted on its shaft to allow an equal amount of travel, clockwise and counterclockwise, from the "0" degree tilt index mark on the front panel. The minimum travel must be ±15 degrees from "0" degree.

The "ANT-TILT" control knob shaft must be friction adjusted so that a torque of 15 ±5 inch-ounces is required to turn the shaft.

The exploded view drawing of the mounting plate, synchro, and gear drive assembly (figure 9-10) includes a plan view of the complete assembly and details of the control knob shaft and its travel limiting pin. See figure 9-10 during the following procedures.

b. REMOVAL AND DISASSEMBLY.

Step 1. Remove mounting plate, synchro, and gear drive assembly from CON-1( ) Control by removing the three mounting screws and lockwashers (2 and 3, figure 9-10).

Step 2. Remove flat gear assembly (19) from shaft of synchro (13) by loosening two setscrews (20).

Step 3. Remove spring washer (18) and flatwasher (17) from shaft of synchro (13).

Step 4. Remove synchro (13) by removing two screws (14), lockwashers (15), and bushings (16).

Step 5. Remove lock nut (12) and five washers, items 9, 10, and 11.

Step 6. Align straight pin (8) in gear shaft (5) with hole in bushing, part of plate assembly (4).

Step 7. Use drift pin through hole in bushing to drive pin (8) out of gear shaft (5).

Step 8. Remove gear shaft (5) from plate assembly (4).

Step 9. Remove two flatwashers (6 and 7) from gear shaft (5).

c. REASSEMBLY.--The following reassembly procedure includes all essential alignment and adjustment data for the mounting plate, synchro, and drive gear assembly, and positioning data for the "ANT-TILT" control knob. See figure 9-10 and the group assembly parts list for figure 9-10, which appears in section VII after the parts list for major replaceable parts, for parts identification.

Step 1. Place flatwasher (6, figure 9-10) and then flatwasher (7) on gear shaft (5).

Step 2. Insert the threaded end of gear shaft (5) through the bushing of plate assembly (4). Shaft must be inserted in plate end of bushing.

Step 3. Align the pin hole in gear shaft (5) with the hole and slot in the plate assembly (4) bushing. See detail A of figure 9-10 and insert straight pin (8) in gear shaft (5) as indicated.

NOTE

Observe the referenced angles between the straight pin (8) and the flat on gear shaft (5). Make sure the proper gear shaft (5) is used on the CON-1( ) Control types indicated.

Step 4. Place washers on threaded end of gear shaft (5) in the following order: flatwasher (9), flatwasher (10), spring washer (11), flatwasher (10), and flatwasher (9).

Step 5. Place locknut (12) on threaded end of gear shaft (5) and tighten only enough to take up end play of shaft.

Step 6. Attach synchro (13) to plate assembly (4) with two screws (14), lockwashers (15), and bushings (16).

Step 7. Place flatwasher (17) and spring washer (18) on shaft of synchro (13) in that order.

Step 8. Align straight pin (8) in gear shaft (5) with hole in plate assembly (4) bushing. This will position the gear shaft (5) at its center of travel.

Step 9. Apply flat gear assembly (19) to shaft of synchro (13). See note below.

NOTE

The center teeth of the flat gear assembly (19) must mesh with the teeth on gear shaft (5) when gear shaft (5) is positioned as in step 8.

Step 10. Press flat gear assembly (19) against spring washer (18) until the teeth of flat gear assembly (19) ride at the approximate center of the gear on gear shaft (5) but do not flatten spring washer (18).

Step 11. Secure flat gear assembly (19) to shaft of synchro (13) with two setscrews (20).

Step 12. Rotate gear shaft (5) to both extremes of travel to determine that no binding exists and that the straight pin (18) limits travel before flat gear assembly (19) becomes disengaged.

Step 13. Tighten locknut (12) so that torque required to turn gear shaft (5) is 15 ±5 inch-ounces.

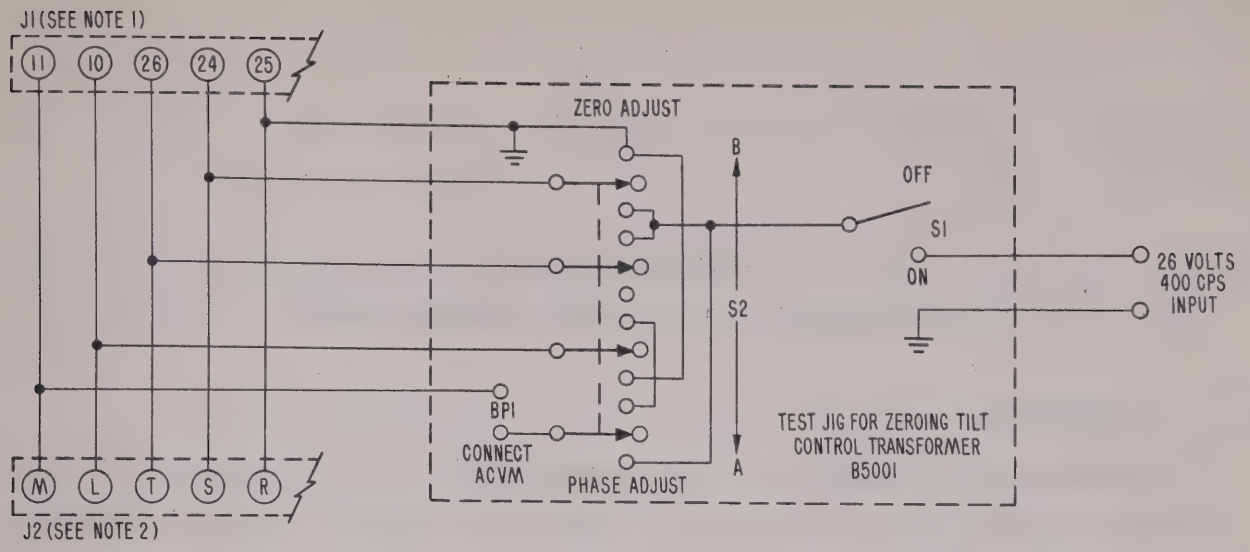
Step 14. Install complete mounting plate, synchro, and gear drive assembly in CON-1( ) Control chassis and attach with three screws (2) and lockwashers (3).

Step 15. Apply control knob to gear shaft (5) with setscrew opposite index mark on control knob setting on flat of shaft.

Step 16. Tighten control knob on shaft with two setscrews, in that adjusted position which permits the control knob to be rotated an equal number of degrees (at least 15) in both directions (from "0" degree).

NOTE

Tilt control transformer synchro B5001 must now be rezeroed by the method described in paragraph 6-3c or 6-3d.



PARTS LIST

BP1 - BINDING POSTS, GR TYPE 938
J1 - CONNECTOR, TYPE DC-37-S
J2 - CONNECTOR, TYPE K03-21-30SN
S1 - SWITCH, SPST TOGGLE
S2 - SWITCH, 4 POLE 3 POSITION TOGGLE (NEUTRAL CENTER POSITION)

NOTES

1. - USE J1 WITH TYPES CON-1A, 1B, -1D CONTROLS.
2. - USE J2 WITH TYPES CON-1G, -1J, -1L-( ), -1M CONTROLS.

Figure 6-1. Test Jig for Zeroing Tilt Control Transformer B5001, Schematic Diagram and Parts List

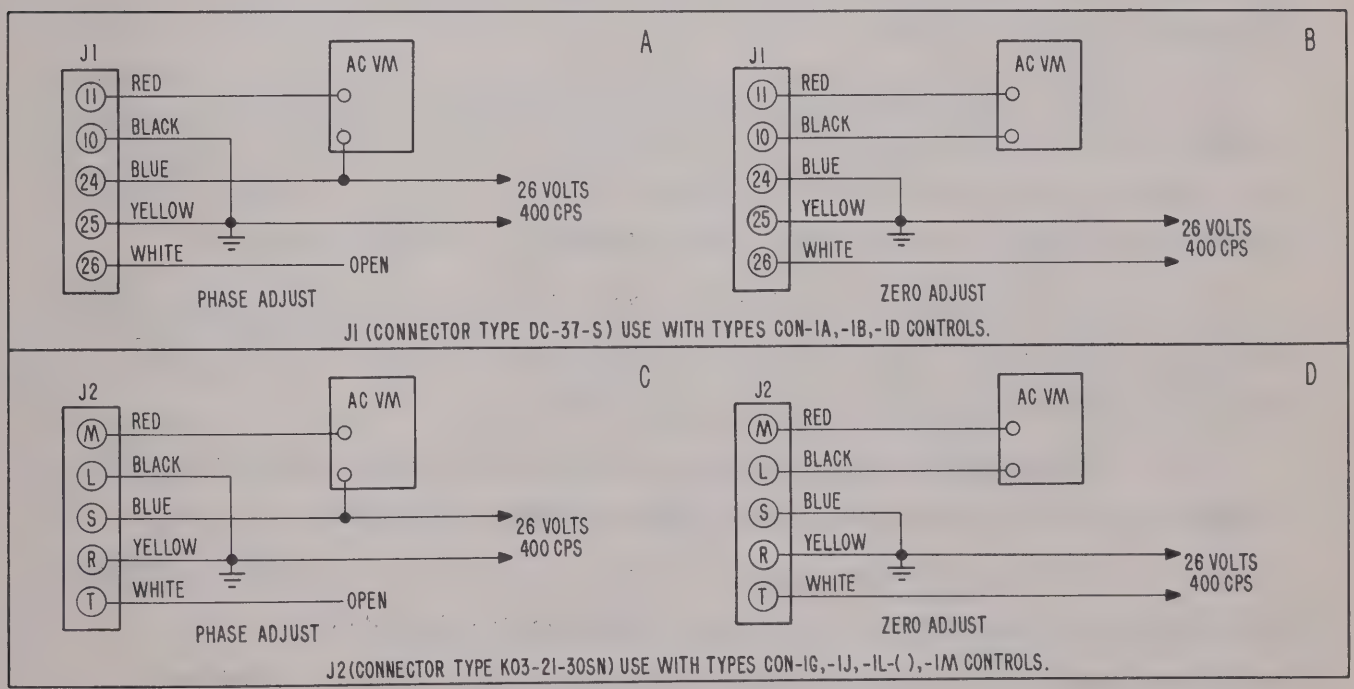


Figure 6-2. Electrical Connections for Zeroing Tilt Control Transformer B5001 Without Test Jig

SECTION VII
SUPPLEMENTARY DATA AND MODIFICATIONS

7-1. GENERAL.

The major differences in the various types of CON-1( ) Controls are covered in sections I and II of this instruction book. The information in this section concerns modifications and improvements.

a. CHANGE OF CONNECTOR P5001.--The electrical connector P5001, type DC-37-P, has been changed to a type K02-21-30PN connector on type CON-1G, CON-1J, CON-1L-1, CON-1L-2, CON-1L-3, CON-1L-4, and CON-1M Controls.

The type DP-37P connector is a miniaturized rectangular connector with polarization of pin and socket assemblies aided by a taper on the engaging portion of the shells. This connector has 37 numerically identified pins. Two screws are used to secure the mating sections.

The type K02-21-30PN connector is a small round connector with a square mounting flange, and polarization is established by a key and slot. This connector has only 21 pins, which are alphabetically identified. A one-half-turn coupling nut locks the mating sections together eliminating the need for screws and screwdriver.

Since the pins of type DC-37-P connectors are numerically identified and those of the type K02-21-30PN are alphabetically identified, a pin correlation chart (table 2-1) is included in section II of this instruction book.

The type CON-1G Control is a type CON-1D Control modified by replacing the type DC-37-P connector with a type K02-21-30PN connector.

The type CON-1M Control is a type CON-1A Control modified by replacing the type DC-37-P connector with a type K02-21-30PN connector.

b. CHANGE OF CONTROL SWITCH S5001.--Type CON-1A, CON-1B, CON-1D, CON-1G and CON-1M Controls use a single-pole, three-position rotary

wafer switch to handle the off-stand-by-on functions of the radar. Additional toggle switches are used in these types to handle all other functional switching. See figure 9-11.

Type CON-1J, CON-1L-1, CON-1L-2, CON-1L-3, and CON-1L-4 Controls use a special rotary wafer switch to handle all functional switching required by the radar. No toggle switches are required or used. See figure 9-12.

c. REPOSITIONING OF ANTENNA TILT CONTROL.--On type CON-1A, CON-1B, CON-1D, CON-1G, and CON-1M Controls, the antenna tilt control knob is located at the upper-center portion of the control panel and the degree-of-tilt calibrations are to the right of the control knob. This arrangement favors the operator to the right of the CON-1( ) Control since the index line on the control knob points to the right. See figure 9-11.

On type CON-1J, CON-1L-1, CON-1L-2, CON-1L-3, and CON-1L-4 Controls, the antenna tilt control knob is centered on the right-hand side of the control panel, and the degree-of-tilt calibrations are to the left of the control knob. This arrangement favors the operator to the left of the CON-1( ) Control since the index line on the control knob points to the left. See figure 9-12.

d. ILLUMINATED CONTROL KNOBS.--Type CON-1J, CON-1L-1, CON-1L-2, CON-1L-3, and CON-1L-4 Controls feature two special control knobs, one for all function switching and the other for antenna tilt control. These two knobs are made of clear Tenite covered with black masking on front with a white translucent index line running from center to tip of pointer. The knobs are so designed that the BENDIX DA-NITE system of panel illumination also illuminates the index line on the knobs. The index line can, therefore, be kept visible under adverse lighting conditions and at night.

e. DUST COVER FASTENERS.--Type CON-1A, CON-1B, CON-1D, CON-1G, and CON-1M Controls use two screwdriver operated spring-lock fasteners to secure the dust cover to the chassis of the CON-1( ) Control.

A single screwdriver-operated Scovill one-quarter-turn fastener is used on type CON-1J, CON-1L-1, CON-1L-2, CON-1L-3, and CON-1L-4 Controls.

f. CONTROL PANEL SIZE.--The control panels on all type CON-1( ) Controls have less height than the control panels on all other type CON-1( ) Controls. See figures 3-1 through 3-6.

g. CHASSIS SIZE.--The chassis of type CON-1J and all type CON-1L( ) Controls have less height than the chassis of all other type CON-1( ) Controls. See figures 3-1 through 3-6.

h. WEIGHT.--Size reductions have resulted in weight reductions of type CON-1J and all type CON-1L( ) Controls. See table 1-1.

SECTION VIII
PARTS LIST

8-1. GENERAL.

This section contains a parts list of major replaceable parts for all types of CON-1( ) Controls and is keyed to the parts called out numerically in figures 9-8 and 9-9.

Figure 9-8 illustrates the location of parts on type CON-1A, CON-1B, CON-1D, CON-1G, and CON-1M Controls.

Figure 9-9 illustrates the location of parts on type CON-1J and CON-1L-( ) Controls.

Also included in this section is a group assembly parts list keyed to an exploded view drawing of the mounting plate, synchro, and gear drive assembly (figure 9-10) which is referenced as item 10 in the parts list of major replaceable parts.

PARTS LIST OF MAJOR REPLACEABLE PARTS OF TYPE CON-1A, -1B, -1D, -1G, -1J, -1L-1, -1L-2, -1L-3, -1L-4, AND -1M CONTROLS AND CON-1K CONVERSION KIT

FIGURE NO. AND ITEM REFERENCE NO.	SYMBOL NUMBER	NAME OF PART	USED ONLY ON CON-( ) TYPES AS NOTED	BENDIX PART NO.
9-8, 9-9 (1)		Chassis and mounting panel assembly	A, B, M* D, G* J L-1, 2, 3, 4	N282785-1 N282785-2 L2085111-1 L2085111-2
9-8, 9-9 (2)	P5001 P5001	Connector, electrical (type DC-37P) Connector, electrical (type K02-21-30PN)	A, B, D G, J, M, L-1, 2, 3, 4	C287253-2 A287304-3
9-8 (3)		Cover assembly	A, B, D, G*, M* J L-1, 2, 3, 4	L282268-1 L2080200-1 L2080200-2
9-8 (4) 9-8 (5)		Knob, control (for S5001, B5001) Knob, control (for S5001, B5001, R5001)	A, B, M D, G	L245269-13
9-9 (6)		Knob, control (for S5001, B5001)	J, L-1, 2, 3, 4	L2080198-1
9-9 (7)		Knob, control (for R5001)	J, L-1, 2, 3, 4	C2080253-1
9-9 (8)		Knob, control (for R5002)	J, L-1, 2, 3, 4	A245182-1
9-8, 9-9 (9)	I5001 I5002	Lamp, panel, incandescent	All except CON-1K	C221312-4
9-8, 9-9 (10)		Mounting plate assembly (see figure 9-10 for exploded view of this assembly including tilt control transformer B5001 and attaching parts)	A, B, D, G, K, M J, L-1, 2, 3, 4	N282767-1 N282767-2
9-8, 9-9 (11)		Panel, front (Plexiglas, masked) (see figures 9-11 and 9-12 for layout and markings; CON-1J has same layout and markings as CON-1L-1)	A, M B D, G J L-1 L-2 L-3 L-4	N691796-1 N691797-1 N676273-1 N2080202-1 N2085206-1 N2085206-2 N2085206-3 N2085206-4
9-8, 9-9 (12)	R5001 R5001	Potentiometer (i-f gain control) Potentiometer (i-f gain control)	A, B, D, G, K, M J, L-1, 2, 3, 4	ERV30GR2U-252 ERV30GR1U-252
9-8, 9-9 (13)	R5002 R5002	Potentiometer (panel lamp control) Potentiometer (panel lamp control)	A, B, D, G, M J, L-1, 2, 3, 4	ERV30GR2U-501 ERV30GR1U-501

* Modified to accept Connector Type K02-21-30PN (P5001)

PARTS LIST OF MAJOR REPLACEABLE PARTS OF TYPE CON-1A, -1B, -1D, -1G, -1J, -1L-1, -1L-2, -1L-3, -1L-4, AND -1M CONTROLS AND CON-1K CONVERSION KIT (Continued)

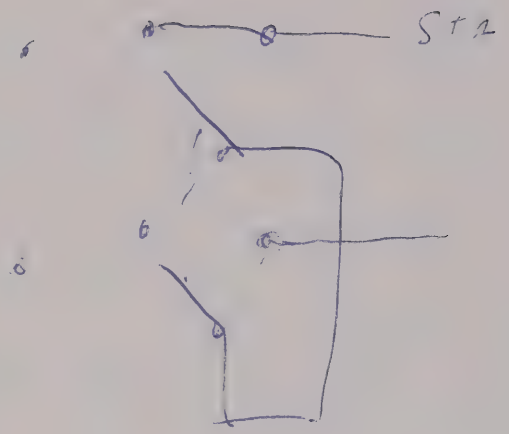
FIGURE NO. AND ITEM REFERENCE NO.	SYMBOL NUMBER	NAME OF PART	USED ONLY ON CON-( ) TYPES AS NOTED	BENDIX PART NO.
9-8, 9-9 (14)	X15001 X15002	Socket, panel lamp	All except CON-1K	C287219-2
9-8, 9-9 (15)	S5001	Switch, single-pole, three-position rotary wafer	A, B, D, G, K, M	C218385-66
	S5001	Switch, two-pole, six-position rotary wafer	J, L-1, 2, 3, 4	L2088042-1
9-8, (16)	S5002	Switch, SPST toggle (contour on-off)	A, B, M	ST 10 A
	S5002	Switch, SPDT center-neutral toggle (contour-off-map)	D, G	ST 52 P
9-8 (17)	S5003	Switch, SPDT toggle (beacon on-off)	D, G	ST 12 D
	S5003	Switch, SPST toggle (beacon on-off)	B	ST 10 A
9-8, 9-9 (18)	B5001	Synchro, tilt control transformer	All	C220908-1

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10.
MOUNTING PLATE, SYNCHRO, AND GEAR DRIVE ASSEMBLY,
PART OF CON-1( ) CONTROL

REFERENCE ITEM NO.	BENDIX PART NO.	NAME OF PART	USED ONLY ON CON-1( ) TYPES AS NOTED	QUANTITY REQUIRED
		MOUNTING PLATE, SYNCHRO, AND DRIVE GEAR ASSEMBLY	All	1
1	N282767-1	. Mounting plate assembly	A, B, D, G, K, M	1
1	N282767-2	. Mounting plate assembly	J, L-1, 2, 3, 4	1
		. . . . . Attaching Parts		
2	HC949B10-832	. Screw, RH	All	3
3	HC799P08-M	. Lockwasher, split	All	3
		- - - 0 - - -		
4	C282919-1	. . Plate assembly	All	1
5	L248684-1	. . Gear	A, B, D, G, K, M	1
5	L248684-2	. . Gear	J, L-1, 2, 3, 4	1
6	HSU779B-0011	. . Washer, flat	All	1
7	HSP779R-0009	. . Washer, flat	All	1
8	HP838R20-0625	. . Pin, straight	All	1
9	HSP779R-0011	. . Washer, flat	All	2
10	HSU779B-0012	. . Washer, flat	All	2
11	OA17027-89	. . Washer, spring	All	1
12	A18442-7	. . Nut, hex	All	1
13	C220908-1	. Synchro, tilt control transformer B5001	All	1
		. . . . . Attaching Parts		
14	HC949B10-632	. Screw, RH	All	2
15	HC799P06-M	. Lockwasher, split	All	2
16	C237804-3	. Bushing, synchro clamp	All	2
		- - - 0 - - -		
17	HSP779-0010	. Washer, flat	All	1
18	OA17027-90	. Washer, spring	All	1
19	C282768-1	. Gear assembly	All	1
		. . . . . Attaching Parts		
20	HC928H04-440	. Setscrew	All	2

SECTION IX
ILLUSTRATIONS

OFF



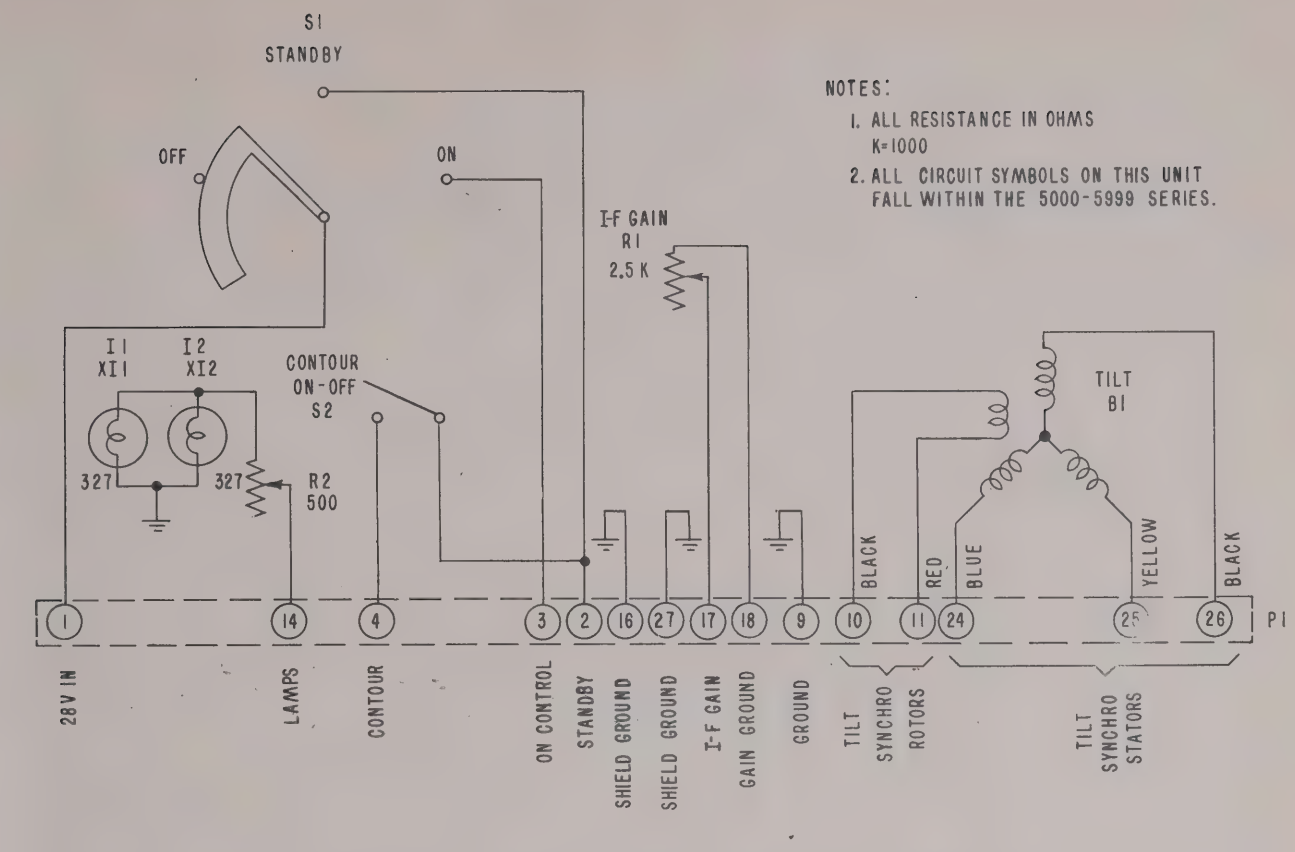


Figure 9-1. CON-1A Control, Schematic Diagram

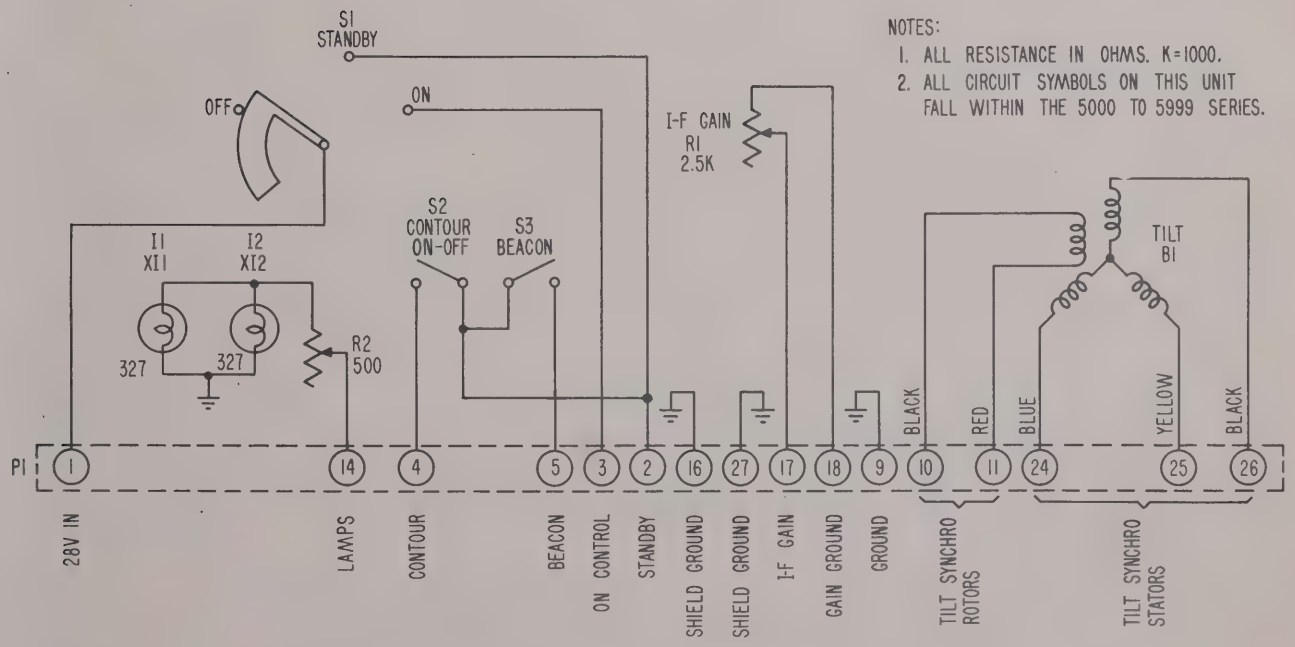


Figure 9-2. CON-1B Control, Schematic Diagram

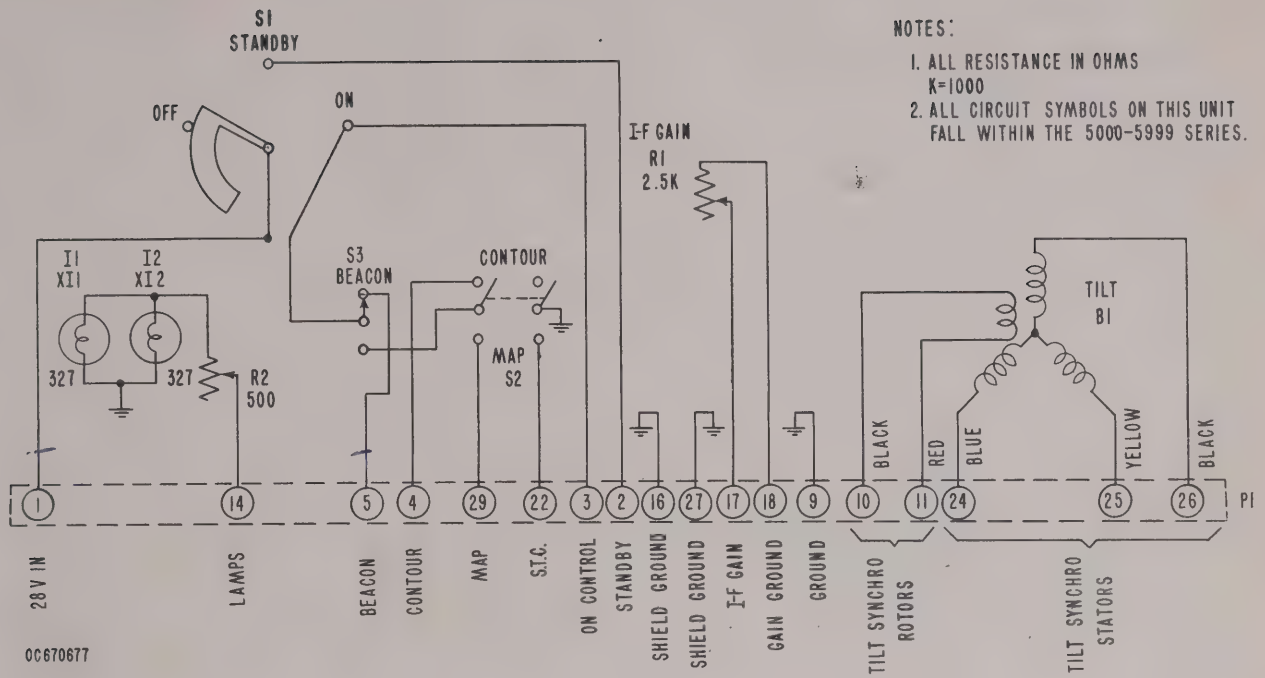


Figure 9-3. CON-1D Control, Schematic Diagram

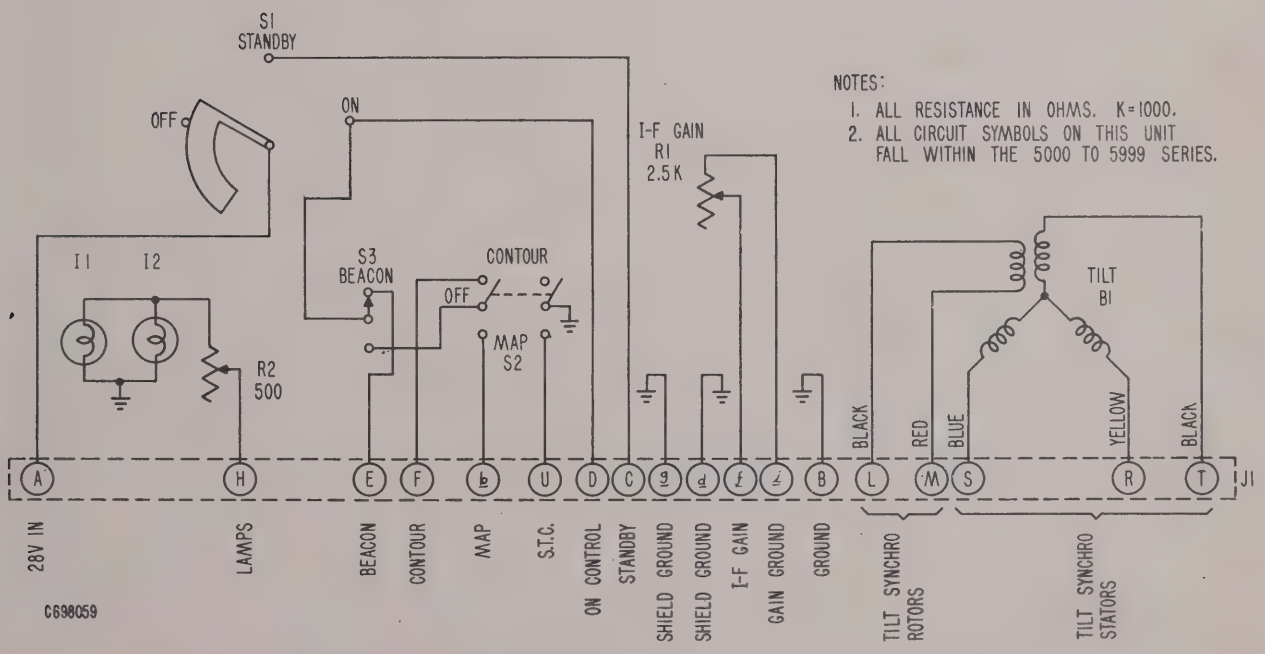


Figure 9-4. CON-1G Control, Schematic Diagram

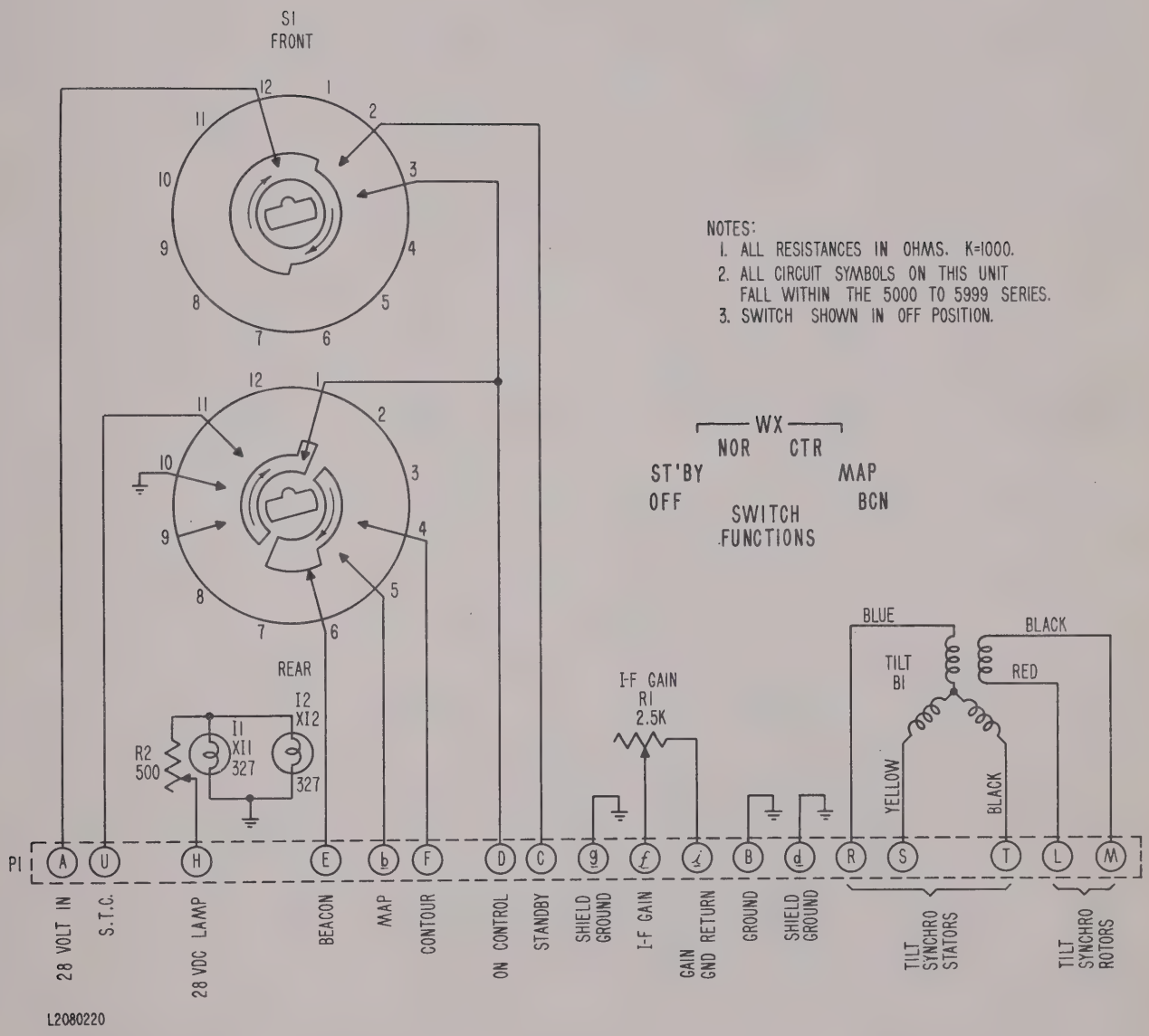
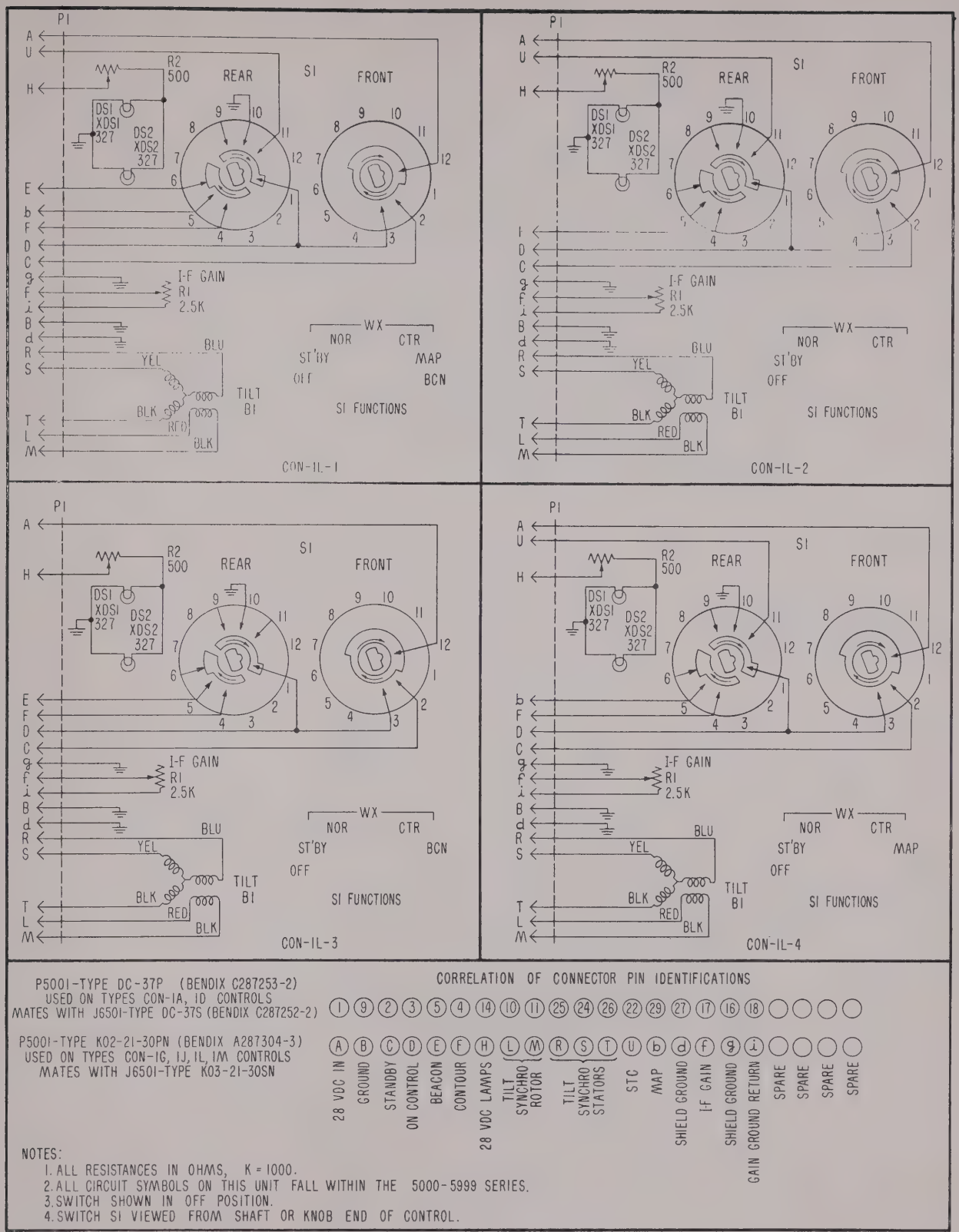


Figure 9-5. CON-1J Control, Schematic Diagram



P5001-TYPE DC-37P (BENDIX C287253-2)
USED ON TYPES CON-IA, ID CONTROLS
MATES WITH J6501-TYPE DC-37S (BENDIX C287252-2)

P5001-TYPE K02-21-30PN (BENDIX A287304-3)
USED ON TYPES CON-IG, IJ, IL, IM CONTROLS
MATES WITH J6501-TYPE K03-21-30SN

CORRELATION OF CONNECTOR PIN IDENTIFICATIONS

1	9	2	3	5	4	14	10	11	25	24	26	22	29	27	17	16	18		
A	B	C	D	E	F	H	L	M	R	S	T	U	b	d	f	g	i		
28 VDC IN	GROUND	STANDBY	ON CONTROL	BEACON	CONTOUR	28 VDC LAMPS	TILT SYNCHRO ROTOR		TILT SYNCHRO STATORS			STC	MAP	SHIELD GROUND	I-F GAIN	SHIELD GROUND	GAIN GROUND RETURN	SPARE	SPARE	SPARE	SPARE

NOTES:
1. ALL RESISTANCES IN OHMS, K = 1000.
2. ALL CIRCUIT SYMBOLS ON THIS UNIT FALL WITHIN THE 5000-5999 SERIES.
3. SWITCH SHOWN IN OFF POSITION.
4. SWITCH S1 VIEWED FROM SHAFT OR KNOB END OF CONTROL.

W2080387

Figure 9-6. CON-1L( ) Controls, Schematic Diagram

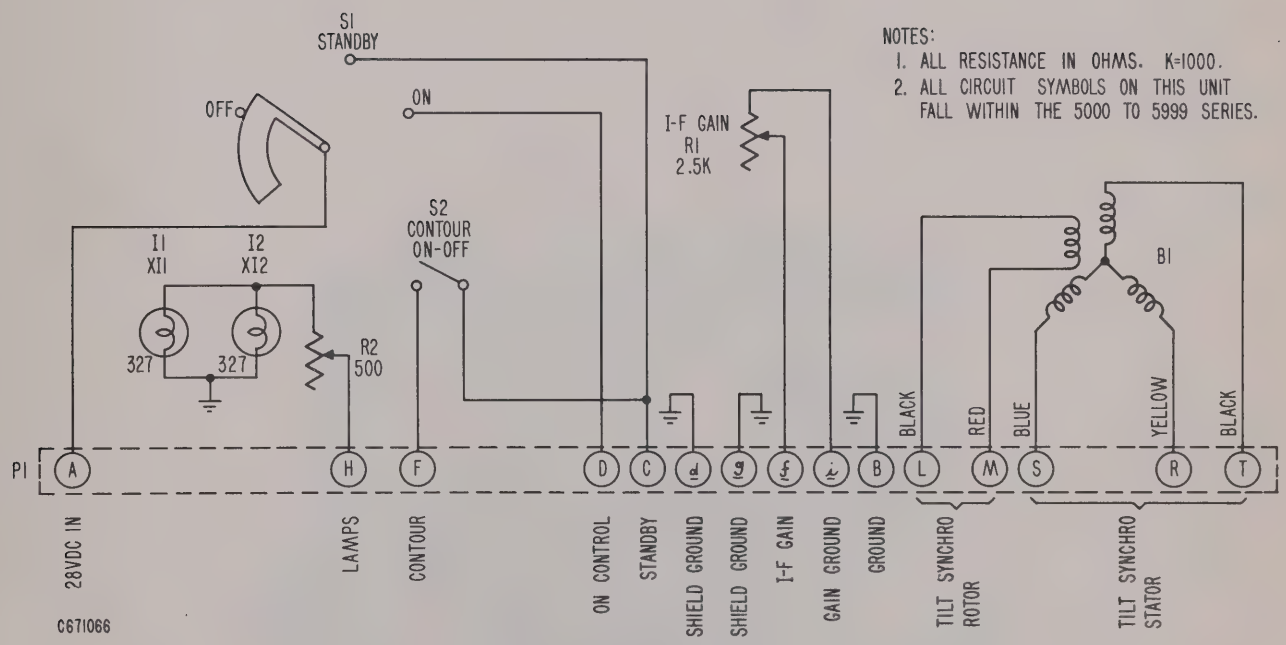


Figure 9-7. CON-1M Control, Schematic Diagram

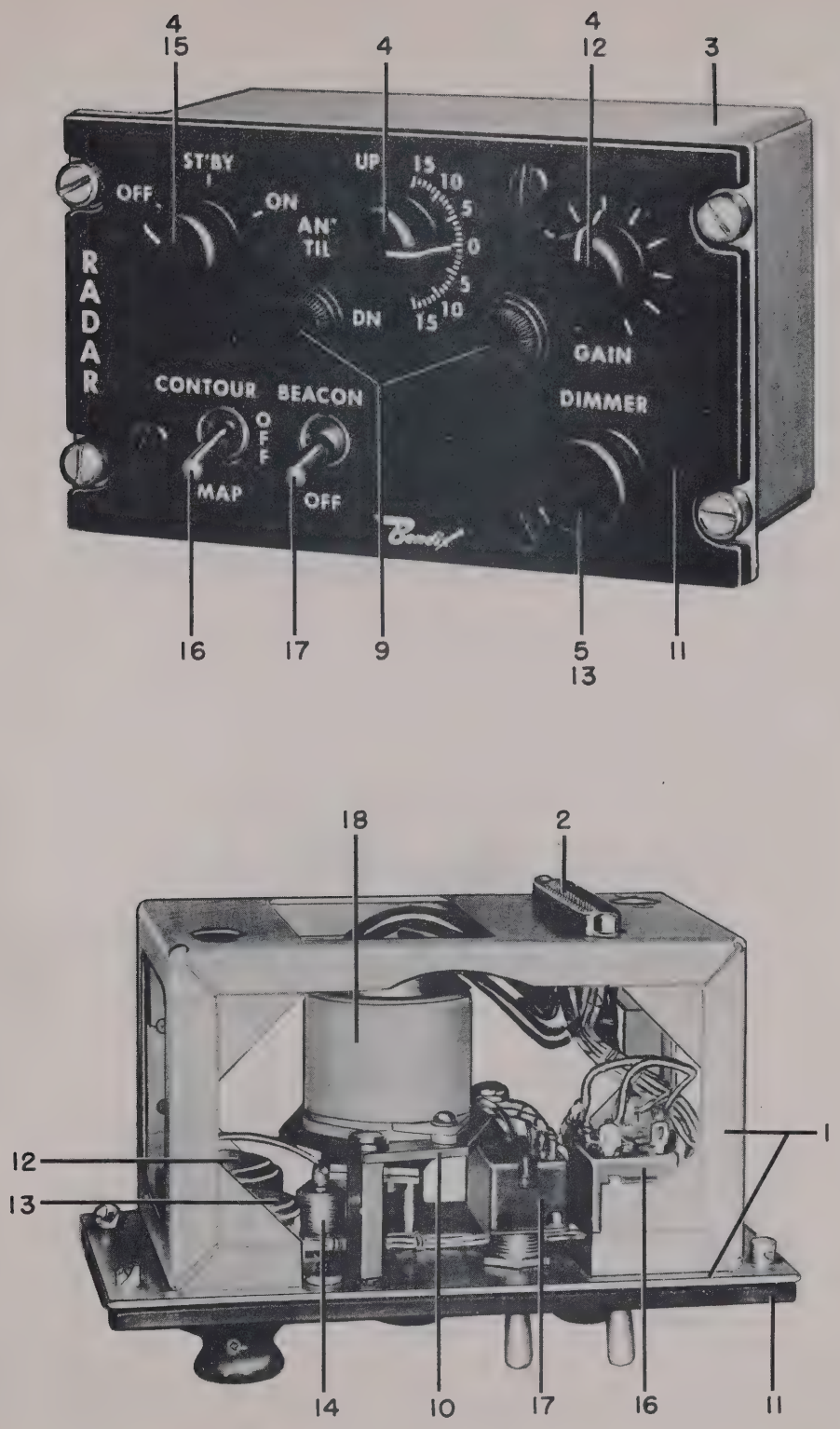


Figure 9-8. Location and Identification of Parts of Type CON-1( ) Controls (see also figure 9-9) (Callout numbers are keyed to the parts list of major replaceable parts in section VIII)

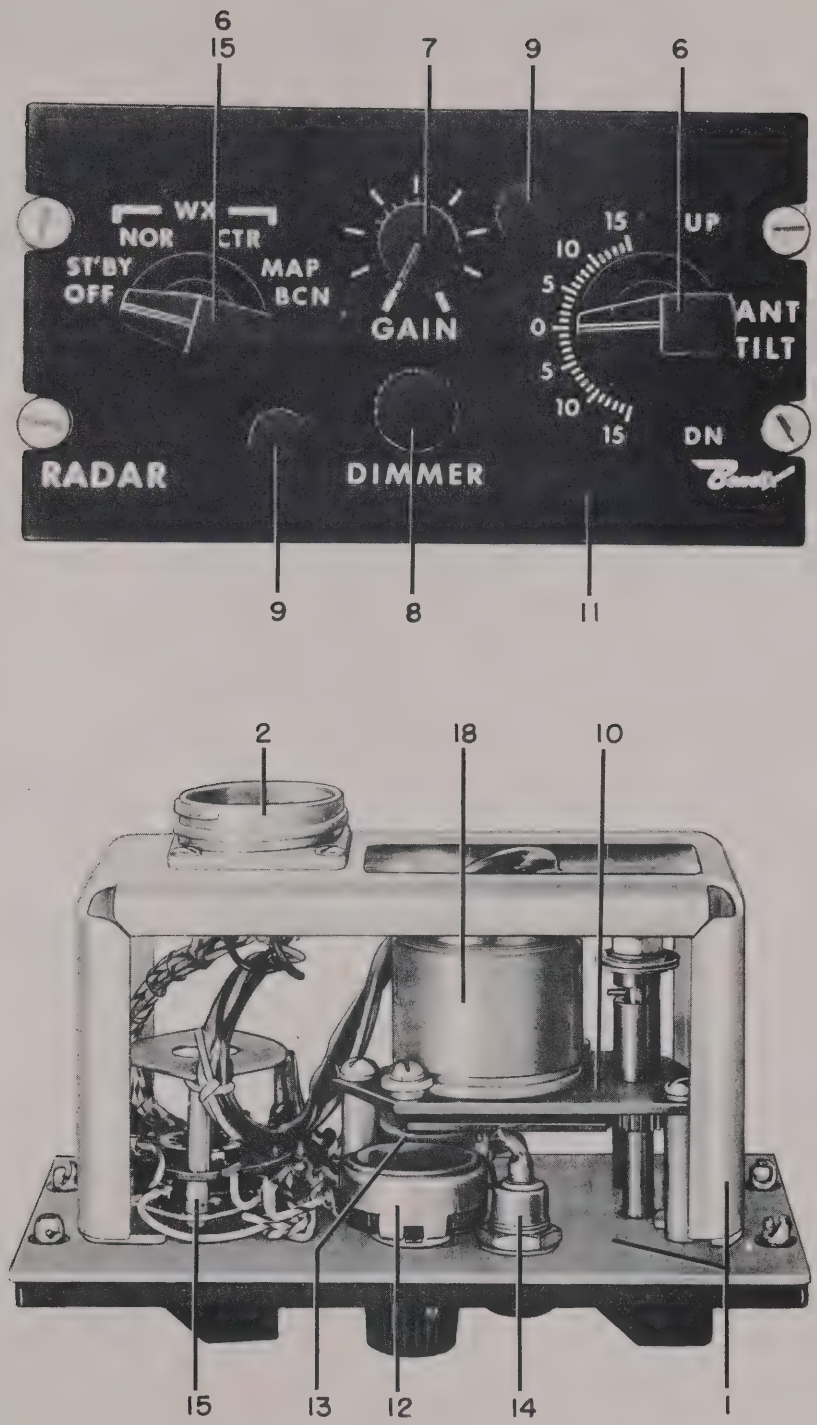


Figure 9-9. Location and Identification of Parts of Type CON-1( ) Controls (see also figure 9-8) (Callout numbers are keyed to the parts list of major replaceable parts in section VIII)

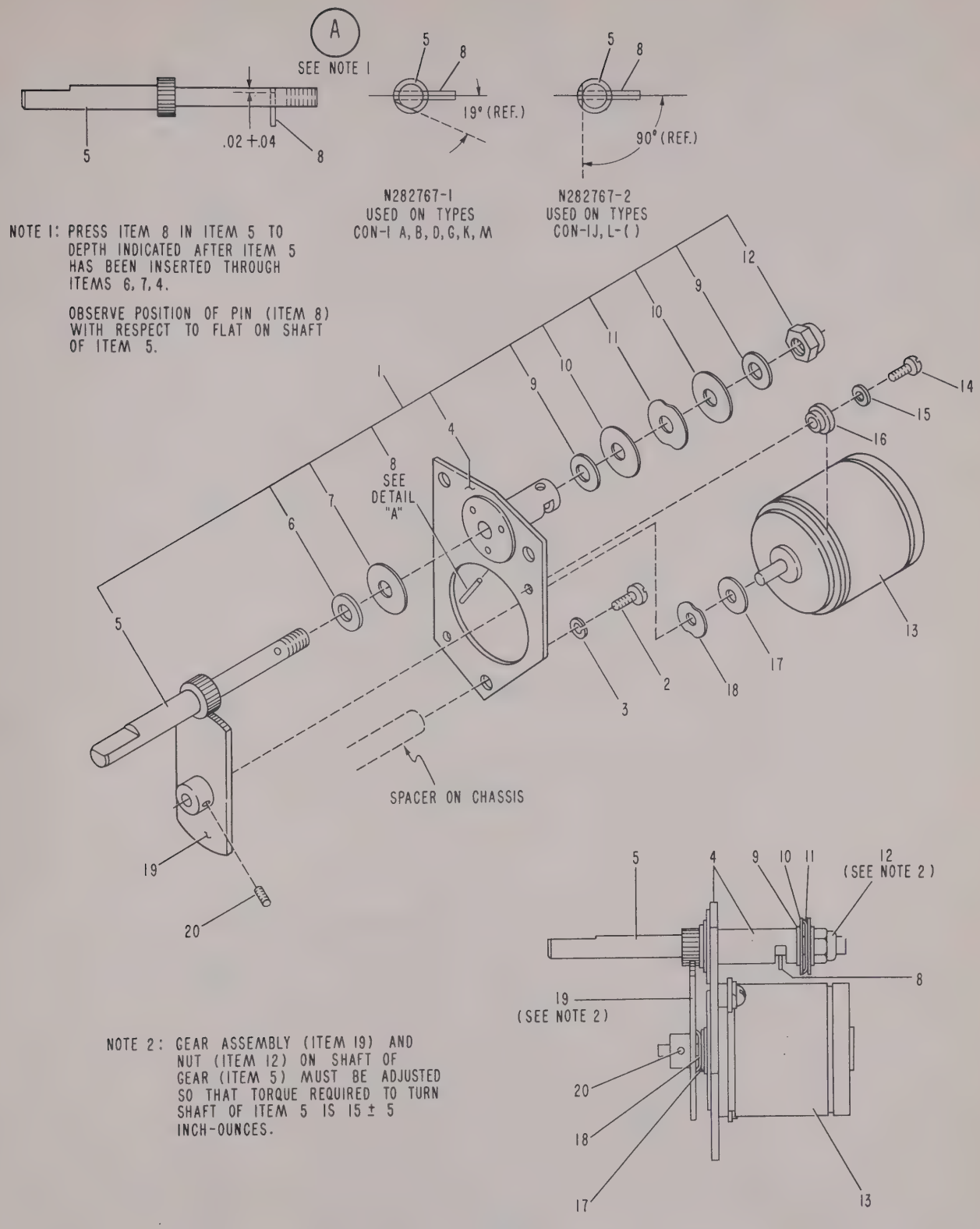
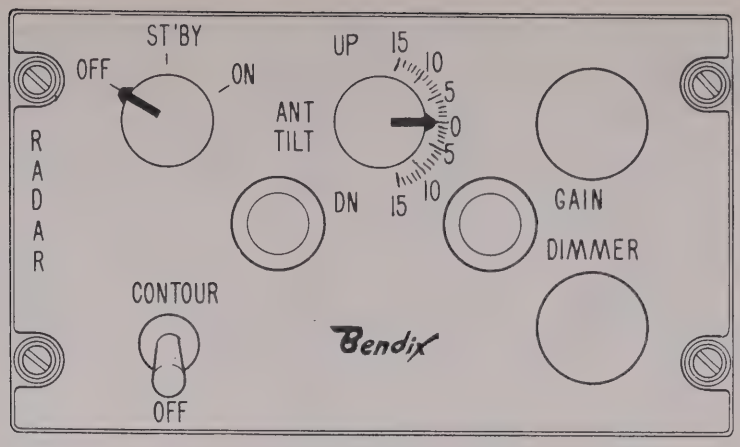
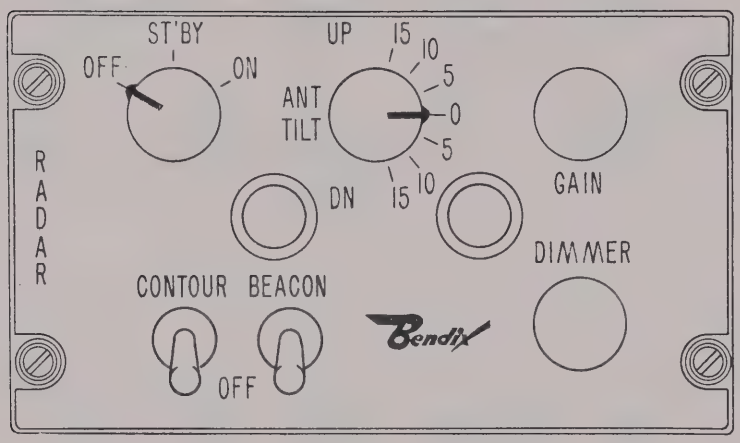


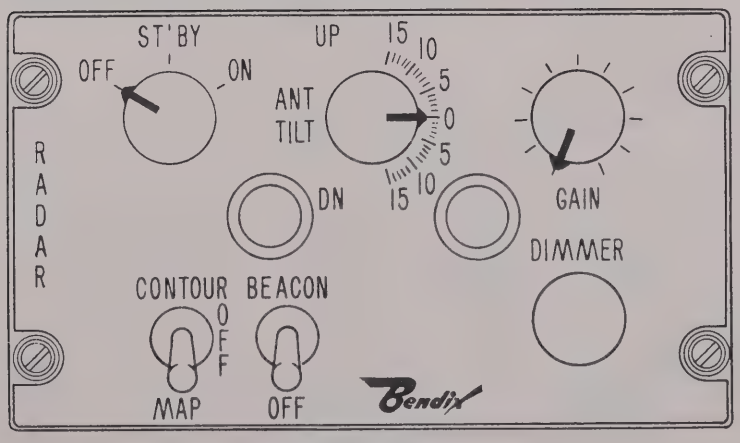
Figure 9-10. Mounting Plate, Synchro, and Gear Drive Assembly, Part of Type CON-1( ) Controls, Exploded View Drawing and Assembly Data (Callout numbers are keyed to the group assembly parts list in section VIII)



CON-1A, CON-1M

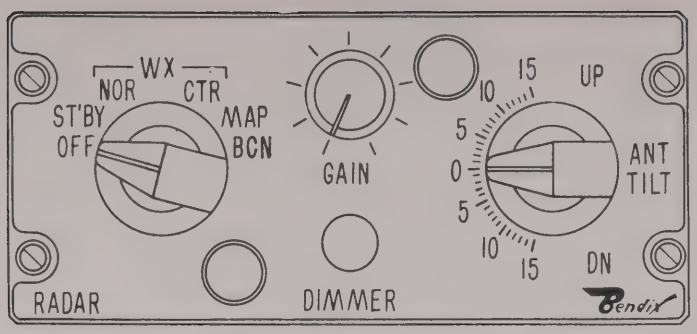


CON-1B

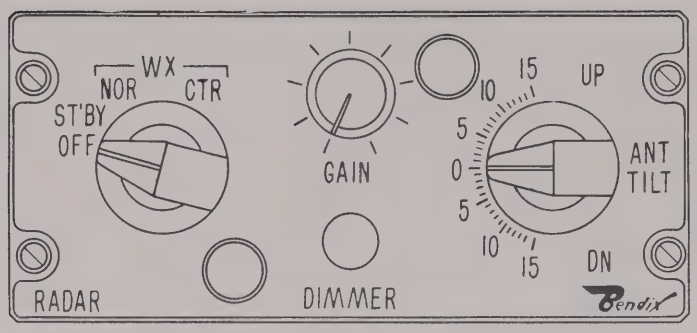


CON-1D, CON-1G

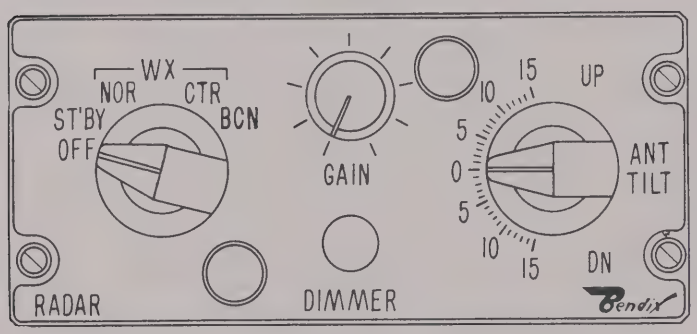
Figure 9-11. Front Panel Layout of Type CON-1A, CON-1B, CON-1D, CON-1G, and CON-1M Controls Showing Switching Functions Incorporated in Each Type



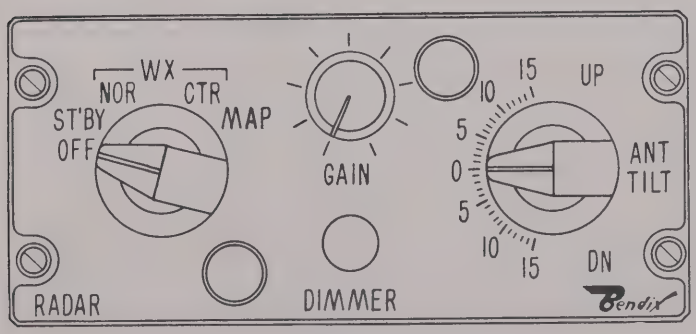
CON-IL-1



CON-IL-2



CON-IL-3



CON-IL-4

Figure 9-12. Front Panel Layout of Type CON-1L( ) Controls Showing Switching Functions Incorporated in Each Type

(Note: Front panel layout and switching functions of type CON-1J Control is same as shown for type CON-1L-1.)

NOTES

NOTES

NOTES

BENDIX RADIO

DIVISION OF BENDIX AVIATION CORPORATION

BALTIMORE 4, MARYLAND

AZR-1A PPI Azimuth Rotator

INSTRUCTION BOOK

RDR-1 AIRBORNE RADAR SYSTEM
Type AZR-1A
PPI AZIMUTH ROTATOR

BENDIX RADIO
DIVISION OF BENDIX AVIATION CORPORATION
BALTIMORE 4, MARYLAND

I.B. 734-2

INSTRUCTION BOOK

RDR-1 AIRBORNE RADAR SYSTEM
Type AZR-1A
PPI AZIMUTH ROTATOR

BENDIX RADIO
DIVISION OF BENDIX AVIATION CORPORATION
BALTIMORE 4, MARYLAND

I.B. 734-2

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December 1957

N O T I C E

This instruction book (I.B. 734-2) is one of a series of instruction books for the Bendix type RDR-1 Airborne Radar System and should be placed in instruction book I.B. 734 [titled: RDR-1 Airborne Radar System Type CCN-1 ( ) Controls and Accessories] after instruction book I.B. 734-1 [titled: RDR-1 Airborne Radar System Type CCN-1( ) Controls].

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Figure 1-1. AZR-1A PPI Azimuth Rotator, An Accessory For the Bendix Type RDR-1 Airborne Radar System

SECTION I
GENERAL DESCRIPTION

1-1. GENERAL.

This instruction book (I.B. 734-2) describes the Bendix type AZR-1A PPI Azimuth Rotator (figure 1-1), hereinafter referred to as the AZR-1A. The AZR-1A is an optional accessory for the Bendix type RDR-1 Airborne Radar System.

1-2. FUNCTION OF THE EQUIPMENT.

The AZR-1A is a three-inch, panel-mounting control which permits the pilot to rotate the scope presentation of type PPI-1( ) Indicators to any point up to 90 degrees to the right or left of the aircraft's heading. Rotating the scope presentation 90 degrees provides a full range (150 miles maximum) presentation to the right or left of the aircraft's heading. Zone avoidance and coastline tracking to a maximum range of 150 miles to either side of the flight path represent two prime functions made possible by the use of an AZR-1A in conjunction with a type RDR-1 Airborne Radar System.

1-3. DESCRIPTION OF EQUIPMENT.

a. ELECTRICAL.--The AZR-1A contains a three-phase differential synchro, the Bendix DA-NITE system of panel illumination, a two-position ("CUT-IN") wafer switch, a warning light on the front panel (in-circuit indicator), provisions for a remote in-circuit indicator, and a rear connector through which all electrical connections are made.

b. MECHANICAL.--The AZR-1A is housed in an aluminum panel-mounting instrument-type case and weighs 1.5 pounds.

The differential synchro is geared to a control knob on the front panel and to a degree-of-rotation indicator which is visible through a window on the front

panel. Two adjustable mechanical stops are used to limit the synchro rotor and degree-of-rotation indicator mechanism travel.

1-4. EQUIPMENT SUPPLIED.

The equipment supplied as a type AZR-1A is listed in table 1-1 together with the weight and dimensions of the unit.

TABLE 1-1. EQUIPMENT SUPPLIED

TYPE NUMBER	NAME OF UNIT	DIMENSIONS (OVER-ALL) (INCHES)			WEIGHT (POUNDS)
		LENGTH	WIDTH	HEIGHT	
AZR-1A	PPI Azimuth Rotator	5.88	3.25	3.25	1.5

1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The AZR-1A is an accessory unit for use with type RDR-1 Airborne Radar Systems. The only additional equipment for installation and operation other than that required for system installation and operation is a mating connector for plug P1 (type AN3102A-20-27P) and an interconnecting cable between the AZR-1A and the aircraft junction strip.

The mating connector required is type AN3106A-20-27S (straight), or type AN-3108A-20-27S if an angle connector is desired.

The interconnecting cable requires three leads of #20 wire (four, if a remote warning lamp is used) and two lengths of #22, three conductor shielded. All wires must be stranded.

SECTION II
THECRY OF OPERATION

2-1. GENERAL.

The Bendix Type RDR-1 Airborne Radar System uses an off-centered ppi type scope presentation on which maximum range is displayed at 0 degree in azimuth which is the heading of the aircraft. The percentage of maximum range displayed decreases from 100 per cent at 0 degree in azimuth to approximately 57 per cent at 90 degrees, and increases from approximately 57 per cent at 270 degrees to 100 per cent at 0 degree (or 360 degrees) in azimuth. This means that the normal scope presentation will display only 57 per cent of the possible maximum range when the antenna is looking off the right wing (90 degrees in azimuth) or off the left wing (270 degrees in azimuth).

Under certain flight conditions, it is desirable to take a maximum range radar-look to the right or left of the aircraft and this is made possible by the addition of an AZR-1A to the servo system of the radar.

A secondary application of the AZR-1A lies in its use as a coarse Rho-Theta navigational device in areas where other navigational devices are at a minimum or non-existant. Its utility is dependent upon the existance of known landmarks such as lakes, islands, prominent coast-line features, or other recognizable targets. Such landmarks are located on the normal PPI-1( ) Indicator display and then, through the use of the AZR-1A, rotated so as to be made to appear on the 0 (zero) degree azimuth line on the indicator overlay. Heading to the known reference target can then be read directly from the AZR-1A dial while distance is taken off the scope display. Accuracy of azimuth information is ± 2 degrees while range measurement accuracy is dependent upon the operator's ability to interpolate between range marks.

2-2. AZR-1A ELECTRICAL COMPONENTS.

a. DIFFERENTIAL SYNCHRO B1.--The AZR-1A contains a three-phase differential synchro which has its rotor geared to a control knob on the front panel. The angular relationship of rotor to stator is manually variable by rotation of the control knob. The stator is in a fixed, adjusted position.

Figure 2-1 is a simplified schematic diagram of the radar set's azimuth (sweep synchronizing) servo loop showing differential synchro B1 in circuit.

In operation, when the synchro data voltages from azimuth synchro generator B2002 in the antenna are applied to the differential synchro stator windings (S1, S2, S3), each of the three windings (R1, R2, R3) on the rotor has a voltage induced in it. The magnitude of the induced voltages depends on the position of the rotor and on the stator voltages. The input-output ratio between any one stator winding and a rotor winding is one-to-one. Thus, when the differential synchro is on electrical zero, with its rotor windings aligned with their corresponding stator windings (R1-S1, R2-S2, R3-S3), the voltage induced in each rotor winding is equal to the voltage applied to the corresponding stator winding. Then, the effect on sweep control transformer B1002 in the PPI-1( ) Indicator, which has its stator windings connected to the rotor windings of differential synchro B1, is just as if the sweep control transformer stator windings were connected directly to the stator windings of azimuth synchro generator B2002 in the antenna.

Under these conditions, the magnetic field (A_1), which induces the voltages in the stator windings of azimuth synchro B2002 in the antenna, is reproduced in sweep control transformer synchro B1002 in the PPI-1( ) Indicator. The reproduced field (A_2) will have the same magnetic vector potential as field A_1. Therefore, when the rotor of differential synchro B1 is in its electrical zero position (S1-R1, S2-R2, S3-R3 aligned), $A_2 = A_1$ and the magnetic vector potential of both fields will have the same angular orientation.

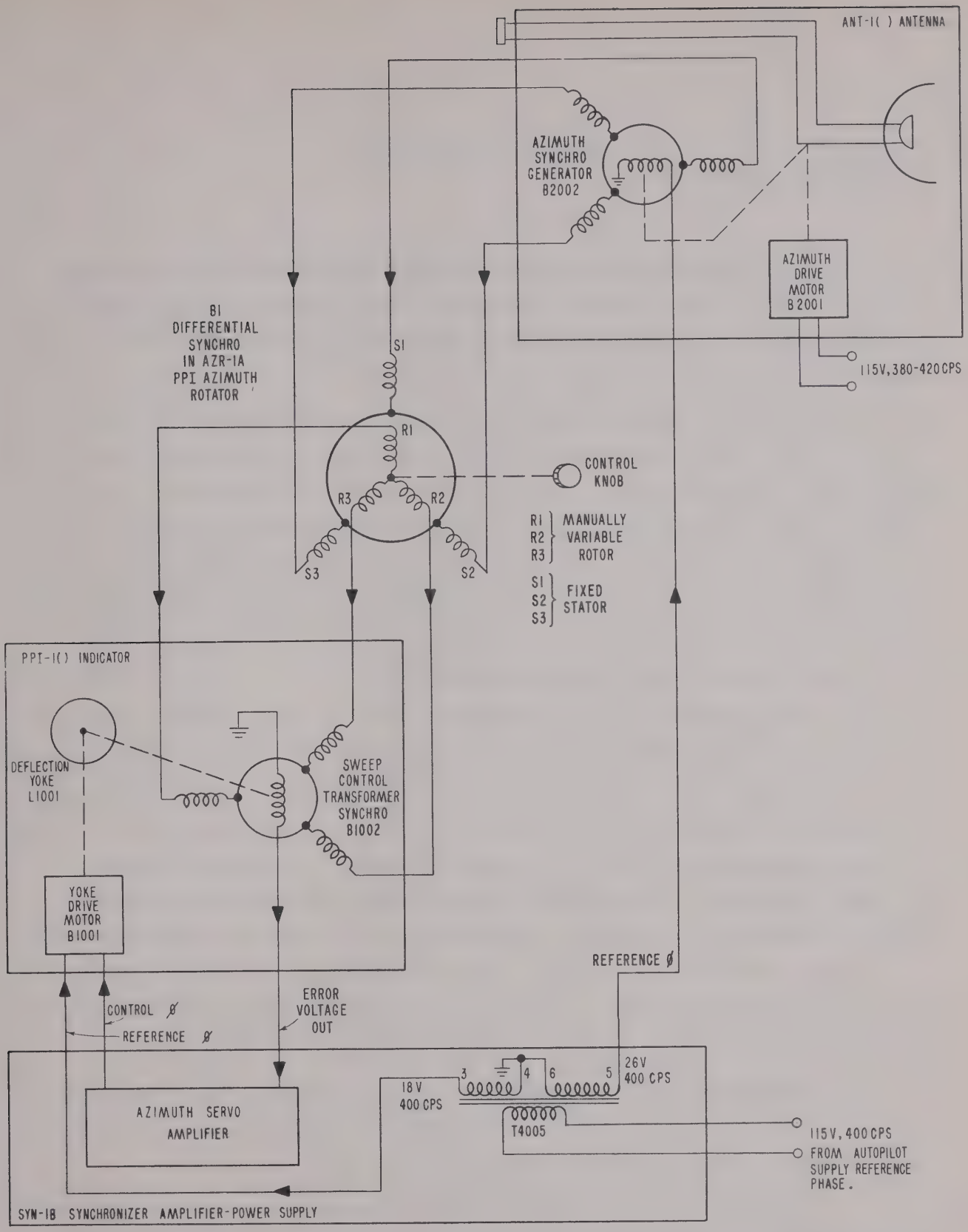

Figure 2-1. Azimuth (Sweep Synchronizing) Servo System Of the Bendix Type RDR-1 Airborne Radar System Showing Differential Synchro B1 of the Type AZR-1A PPI Azimuth Rotator in Circuit, Schematic Diagram

THEORY OF OPERATION

As the rotor of differential synchro B1 is manually rotated ±n-degrees from its electrical zero position, the magnetic vector potential of field A_2 will rotate until it is angularly displaced from the magnetic vector potential of field A_1 by ±n-degrees.

The rotor of sweep control transformer synchro B1002 in the PPI-1( ) Indicator will see this angular displacement of the magnetic vector potential of field A_2 as a ±n-degree error. This will cause the deflection yoke drive motor B1001 to speed up or slow down until the sweep trace indication on the scope leads or lags the actual instantaneous azimuth position of the antenna by ±n-degrees. The speed of antenna and sweep trace rotation will then synchronize, but the angular difference between the actual azimuth position of the antenna and the azimuth indicated on the scope will differ by ±n-degrees at every instant.

b. DEGREE-OF-ROTATION INDICATOR.--The angular position of the differential synchro rotor, with respect to its electrical zero position, is indicated in degrees by numbers on a metal tape and wheel combination which is visible through a window in the front panel of the AZR-1A. The wheel and tape combination is calibrated to indicate from 270 degrees through 359 degrees and from 000 degree through 090 degrees. The calibrated wheel is geared to the differential synchro drive and indicates each unit degree of rotor travel. The calibrated tape is actuated by a Geneva movement and indicates a change of ten degrees for each complete revolution of the calibrated wheel. Two adjustable mechanical stops are set to limit the rotor travel to 000 degree ±90 degrees (indicated as 090 or 270).

Clockwise rotation of the control knob increases the degree-of-rotation indication from 270 degrees to 360 degrees (indicated as 000) and from 000 degree to 090 degrees. Counterclockwise rotation reverses the process.

When the AZR-1A is set to indicate n-degree (between 000 and 090), the scope display will be shifted counterclockwise n-degrees and the maximum range

displayed at 0 degree on the scope will now be of targets at n-degrees to the right of the aircraft's heading.

When the AZR-1A is set to indicate n-degrees (between 270 and 359), the scope display will be shifted clockwise n-degrees and the maximum range displayed at 0 degree on the scope will now be of targets n-degrees to the left of the aircraft's heading.

c. CUT-IN SWITCH S1.--Switch S1 serves two functions. It is primarily an CUT-IN switch for the differential synchro. When switch S1 is in the "CUT" position, input pins A-B-C of connector plug P1 are connected to output pins D-E-F and the differential synchro B1 is shorted out of the circuit. See the schematic diagram of the AZR-1A in figure 9-1. When switch S1 is in "IN" position, input pins A-B-C are connected to the differential synchro stator windings and the rotor windings are connected to output pins D-E-F. The differential synchro is then connected between the output of the azimuth synchro generator B2002 in the antenna and sweep control transformer B1002 in the PPI-1( ) Indicator.

When switch S1 is in "IN" position, 28 volts dc is connected to warning indicator lamp DS2 on the front panel of the AZR-1A and to pin J of connector plug P1 for operation of an optional remote warning indicator lamp. The warning indicator lamps will light when the differential synchro is in circuit (S1 in "IN" position).

d. PANEL LIGHTING.--Panel lamp DS1 is part of the Bendix DA-NITE system of panel illumination and is controlled by the master panel light dimmer control of the aircraft when pin K of connector plug P1 is connected into that circuit.

SECTION III
INSTALLATION

3-1. GENERAL.

The AZR-1A is a panel mounting instrument which can be mounted in any selected location which is convenient to the operator. No shockmounting or ventilation is required.

3-2. MOUNTING DIMENSIONS.

Figure 9-1 is a dimensional outline drawing of the AZR-1A which includes a detailed drawing of the recommended cutout of instrument panel to accept an AZR-1A. Four 6-32 binder head screws and stop nuts (not furnished) are recommended for AZR-1A mounting.

3-3. INTERCONNECTING WIRING.

Figure 3-1 is a wiring diagram showing how the AZR-1A interconnects into a type RDR-1 Airborne Radar System. Figure 3-1 must be used with the RDR-1 Airborne Radar System interconnecting wiring diagram, figure 3-4 in instruction book I.B. 732 (for X-band systems) or I.B. 733 (for C-band systems).

3-4. TEST OF INSTALLATION.

a. GENERAL.--After the AZR-1A has been installed and connected, as in paragraph 3-3, the installation can be operationally tested as follows:

b. TEST PROCEDURE.

Step 1. Set "OUT-IN" switch S1 on AZR-1A to "OUT" position.

Step 2. Set degree-of-rotation indicator on AZR-1A to "000".

Step 3. Manually set antenna to 0-degree azimuth position.

Step 4. Place azimuth drive motor switch S2001 on antenna in "OFF" position.

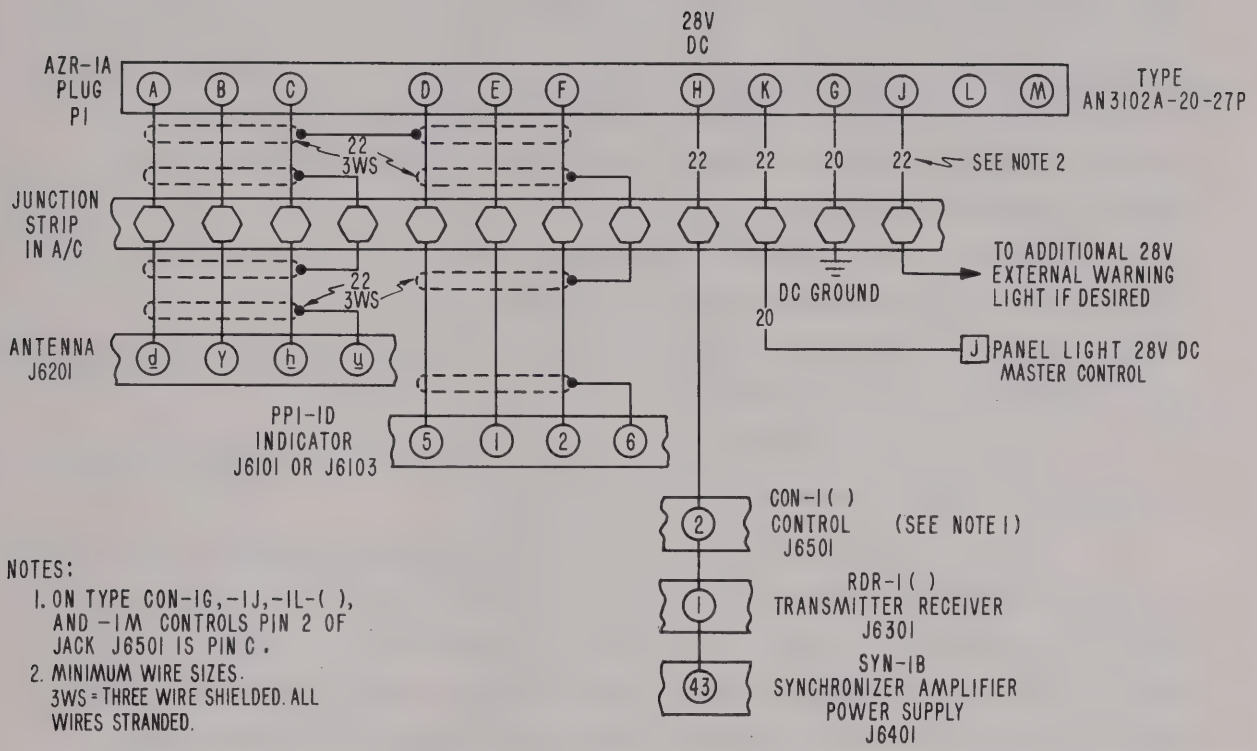

Figure 3-1. Interconnecting Wiring Diagram Showing Connections Between AZR-1A FPI Azimuth Rotator and Bendix Type RDR-1 Airborne Radar System

Step 5. Remove high-voltage fuse F3001 from front panel of transmitter unit to prevent development of r-f pulses which are not required for this test.

Step 6. Turn radar system on.

Step 7. Set "BRILLIANCE" control on PPI-1( ) Indicator so that sweep trace is visible but not too bright. Sweep trace must fall on 0-degree azimuth line to indicate antenna in 0-degree azimuth position, as established in step 3.

Step 8. Set "OUT-IN" switch S1 on AZR-1A in "IN" position. Sweep trace on scope must not move from 0-degree azimuth position as established in step 7.

Step 9. Rotate control knob on AZR-1A clockwise to get degree-of-rotation indications of "030", the "060", and then "090". Sweep trace must rotate counterclockwise and fall on "30", then "60", and then "90" degree radial lines on indicator graticule. This will indicate that the scope display has been properly oriented to display maximum range at 30, 60, and 90 degrees to the right of the aircraft's heading.

Step 10. Set "OUT-IN" switch S1 to "OUT" position. Sweep trace on scope must return to 0-degree azimuth position.

Step 11. Rotate control knob on AZR-1A counterclockwise to return degree-of-rotation indicator to "000".

Step 12. Set "OUT-IN" switch S1 to "IN" position. Sweep trace must not move from 0-degree azimuth position on scope.

Step 13. Rotate control knob on AZR-1A counterclockwise to get degree-of-rotation indications of "330", then "300", and then "270". Sweep trace must rotate clockwise and fall on "30", then "60", and then "90" degree radial lines on indicator graticule. This will indicate that the scope display has been properly oriented to display maximum range at 30, then 60, and then 90 degrees to the left of the aircraft's heading.

Step 14. Set "CUT-IN" switch S1 to "OUT" position. Sweep trace on scope must return to 0-degree azimuth position.

Step 15. Rotate control knob on AZR-1A to return degree-of-rotation indicator to "000".

Step 16. Set "OUT-IN" switch S1 to "IN" position. Sweep trace must not move from 0-degree azimuth position on scope.

Step 17. Note that warning lamp lights when switch S1 is in "IN" position and goes out when switch S1 is in "OUT" position.

Step 18. If remote warning indicator is used, check as in step 17.

Step 19. Test panel lamp brilliance with master dimmer control in aircraft.

Step 20. Turn radar system off.

Step 21. Place azimuth drive motor switch S2001 on antenna in "ON" position and lock with cotter pin.

Step 22. Replace high-voltage fuse F3001 in front panel of transmitter.

SECTION IV
OPERATION

4-1. GENERAL.

The AZR-1A is a passive element in the radar's azimuth (sweep synchronizing) servo system when the "OUT-IN" switch on the front panel is in "OUT" position, or when the degree-of-rotation indicator registers "000" with the switch in either "OUT" or "IN" positions.

Operation of the AZR-1A is simply a matter of switching it in or out of the servo circuit and setting the degree-of-rotation indicator to the desired degree for maximum-range scope presentation of areas of interest to the right or left of the aircraft heading.

Figure 4-1 shows how the action of the AZR-1A effects the scope presentation for degree-of-rotation indications of "270", "000", and "090".

The upper diagram of figure 4-1 shows an aircraft at range zero, a circular target at near maximum range on the line-of-flight path (0-degree azimuth), a square target at near maximum range perpendicular to the line-of-flight path (270 degrees azimuth), and a triangular target at near maximum range perpendicular to the line-of-flight path (90 degrees azimuth). All three of these targets are within the range of the radar as shown by the outer semicircle. The square and triangular targets shown at 270 degrees azimuth and 90 degrees azimuth will not be displayed on the scope, however, since the scope presentation will include only that portion of the maximum range area encompassed by the inner semicircle. The AZR-1A makes it possible to display targets or terrain lying anywhere within the 180-degree arc of the outer semicircle (up to 90 degrees to the right or left of the aircraft heading). This is accomplished by rotating the scope presentation to display the sector of interest at 0 degree in azimuth on the scope where maximum range presentation is possible.

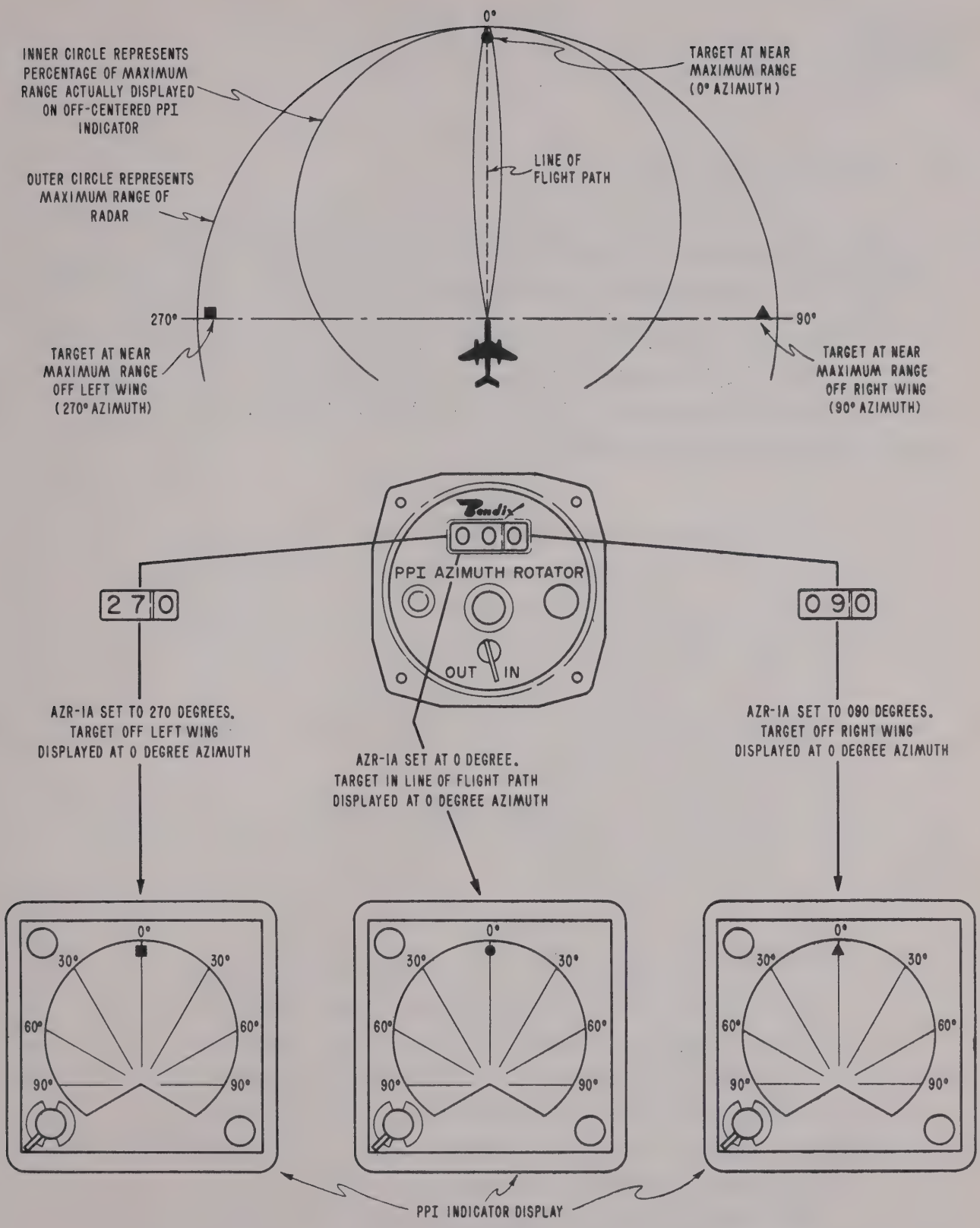

Figure 4-1. Reference Diagram Showing Action of AZR-1A On PPI-1( ) Indicator Displays

4-2. OPERATING PROCEDURE.

a. TO DISPLAY OUT-OF-SCOPE-RANGE TARGETS TO THE RIGHT OF THE AIRCRAFT HEADING.--Radar set must be in full operation. Csc^2 (cosecant-squared) beam or pencil beam can be used on all ranges (20, 50, or 150 miles).

Step 1. Place "OUT-IN" switch on AZR-1A in "IN" position.

Step 2. Starting with a degree-of-rotation indication of "000" on the AZR-1A, rotate the control knob clockwise until the area of interest is centered on the 0-degree azimuth line on the scope.

NOTE

For a degree-of-rotation indication of "090", the scope presentation will have been rotated 90 degrees counterclockwise to display targets or terrain which are 90 degrees to the right of the aircraft's heading. See lower right-hand diagram of figure 4-1. For any setting between "000" and "090", the scope presentation will be rotated by the number of degrees shown on the degree-of-rotation indicator.

It is now possible to alternately display maximum range in the direction of the area of interest and dead-ahead by alternately placing the "OUT-IN" switch in the "OUT" and "IN" positions.

NOTE

As the aircraft continues on its line-of-flight path, the bearing of targets to the right and left of the aircraft heading will increase; therefore, corrections will have to be cranked into the AZR-1A to keep the area of interest centered on the 0-degree line on the scope. The degree-of-rotation indicator will always indicate the azimuth bearing of targets displayed on the 0-degree azimuth line when the "OUT-IN" switch is in "IN" position. When the warning light on the front panel is lit, the AZR-1A is in-circuit.

b. TO DISPLAY OUT-OF-SCOPE-RANGE TARGETS TO THE LEFT OF AIRCRAFT HEADING.--Proceed as in paragraph 4-2a, except control knob on AZR-1A must be rotated counterclockwise, starting with a degree-of-rotation indication of "000".

SECTION V
PREVENTIVE MAINTENANCE

5-1. GENERAL.

A periodic operational test of the AZR-1A should be made by following the test data given in paragraph 3-4. If faulty operation of the AZR-1A is indicated, refer to section VI.

No preventive maintenance procedures are given.

SECTION VI
CORRECTIVE MAINTENANCE

6-1. GENERAL.

This section contains a continuity test and a procedure for the alignment of the differential synchro (zeroing procedure). Except for the replacement of pilot lamps, as required, synchro zeroing, and the repair of obvious wiring faults, no other field service is recommended.

If any unusual or special service problems arise, it is suggested that the Service Department, Bendix Radio Division of Bendix Aviation Corporation, Towson 4, Maryland, be contacted for advice or assistance.

No equipments should be returned to the factory until a return authorization (RA) form is requested and received from the Service Department of Bendix Radio.

6-2. TEST EQUIPMENT REQUIRED.

An ohmmeter is required for continuity testing. The differential synchro in the AZR-1A can be electrically zeroed while the AZR-1A unit is connected into an operating radar system in an aircraft or into a system mockup on the test bench. No additional test equipment is required.

6-3. CONTINUITY TEST.

With the AZR-1A completely disconnected from the radar system, make the continuity tests listed in table 6-1.

TABLE 6-1. AZR-1A CONTINUITY TEST

FROM P1 PIN	TO P1 PIN	READ ON OHMMETER	
		SWITCH S1 "OUT"	SWITCH S1 "IN"
A	B	9 ohms	9 ohms
A	C	9 ohms	9 ohms
A	D	Short	Open
B	E	Short	Open
C	F	Short	Open
D	E	9 ohms	18 ohms
D	F	9 ohms	18 ohms
E	F	9 ohms	18 ohms
H	J	Open	Short
H	G	Open	90 ohms
G	K	150 ohms	150 ohms
A	Ground	Open	Open
D	Ground	Open	Open
G	Ground	Open	Open

6-4. DIFFERENTIAL SYNCHRO ZEROING PROCEDURE.

a. GENERAL.--Remove dust cover from AZR-1A and connect into an operable RDR-1 Airborne Radar System either in an aircraft installation or in a system mock-up on test bench. Connect as outlined in section III, paragraph 3-3.

b. ZEROING PROCEDURE.

Step 1. Set "OUT-IN" switch S1 on AZR-1A to "OUT" position.

Step 2. Set degree-of-rotation indicator on AZR-1A to "000".

Step 3. Manually set antenna to 0-degree azimuth position.

Step 4. Place azimuth drive motor switch S2001 on antenna in "OFF" position.

Step 5. Remove high-voltage fuse F3001 from front panel of transmitter unit to prevent development of r-f pulses during this procedure.

Step 6. Turn radar set on.

Step 7. Set "BRILLIANCE" control on PPI-1( ) Indicator so that sweep trace is visible but not too bright. Sweep trace must fall on 0-degree azimuth line to indicate 0-degree azimuth position of antenna as established in step 3.

Step 8. Set "OUT-IN" switch S1 on AZR-1A to "IN" position. Sweep trace must not move from 0-degree azimuth position as established in step 7. If the sweep trace does change its position, the case of differential synchro B1 must be adjusted, as in steps 9 and 10, to bring the sweep trace back to 0-degree azimuth position.

NOTE

Avoid parallax between sweep trace and 0-degree azimuth line on scope graticule when making this test and adjustment.

Step 9. Use a narrow blade screwdriver which will fit through each of the three holes (1, figure 9-2) in the AZR-1A frame and loosen the three screws (2) securing differential synchro B1 to the frame. Loosen screws only enough to allow manual rotation of synchro case.

Step 10. Manually rotate case of synchro to position sweep trace on 0-degree azimuth line on scope. Synchro case must be so positioned that the sweep trace remains stationary when "OUT-IN" switch S1 is alternately switched to "OUT" and "IN" positions. When the synchro case is so adjusted, tighten the three synchro retaining screws and recheck adjustment.

c. OPERATIONAL TEST.--After differential synchro B1 has been properly zeroed, as in steps 1 through 10 above, make an operational test of the AZR-1A by following steps 9 through 21 of paragraph 3-4b, in section III.

SECTION VII
SUPPLEMENTAL DATA AND MODIFICATIONS

7-1. GENERAL.

This section is reserved for possible future changes, additions, or modifications.

SECTION VIII
PARTS LIST

(To Be Supplied)

SECTION IX
ILLUSTRATIONS

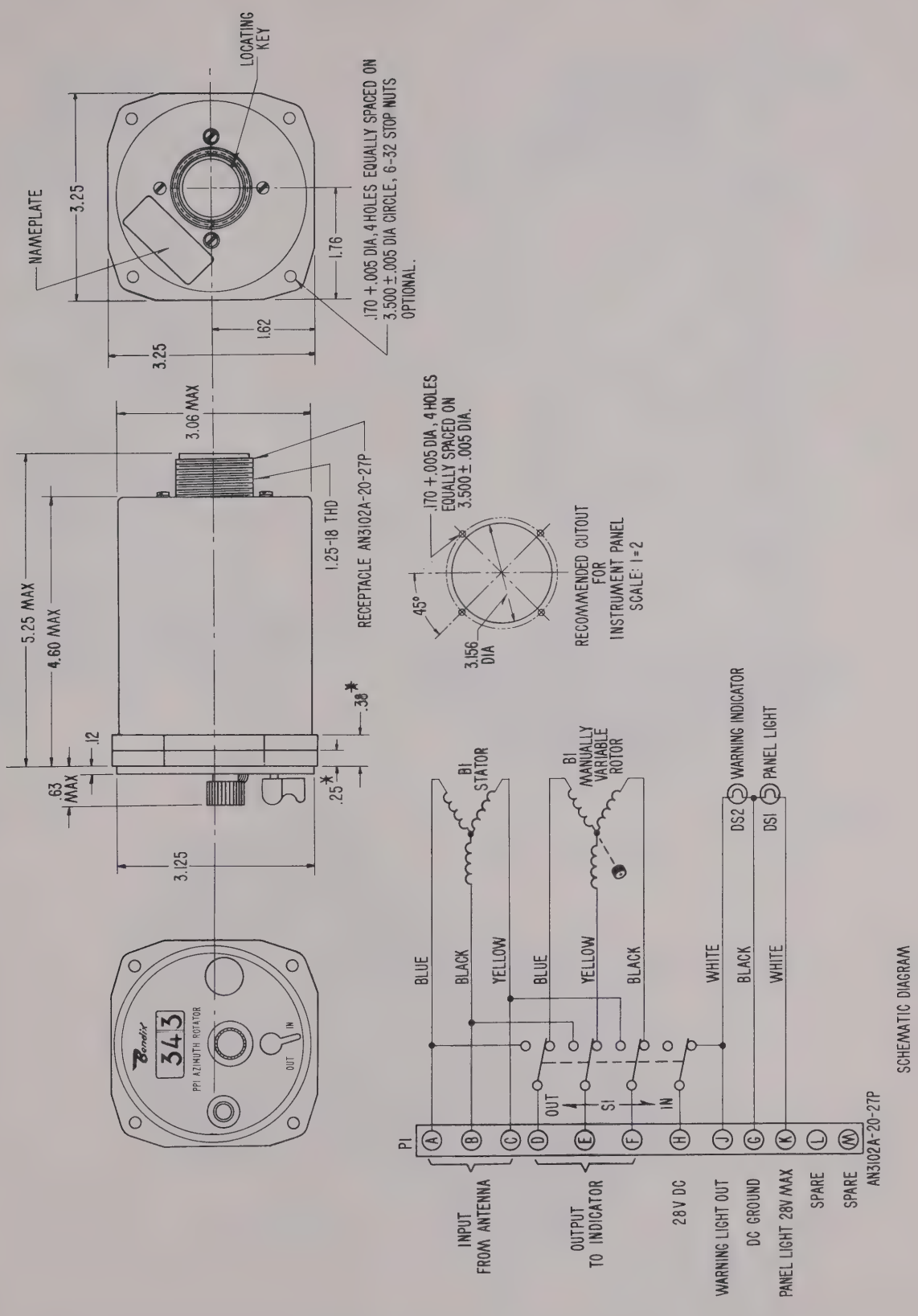

Figure 9-1. AZR-1A PPI Azimuth Rotator, Dimensional Outline Drawing and Schematic Diagram

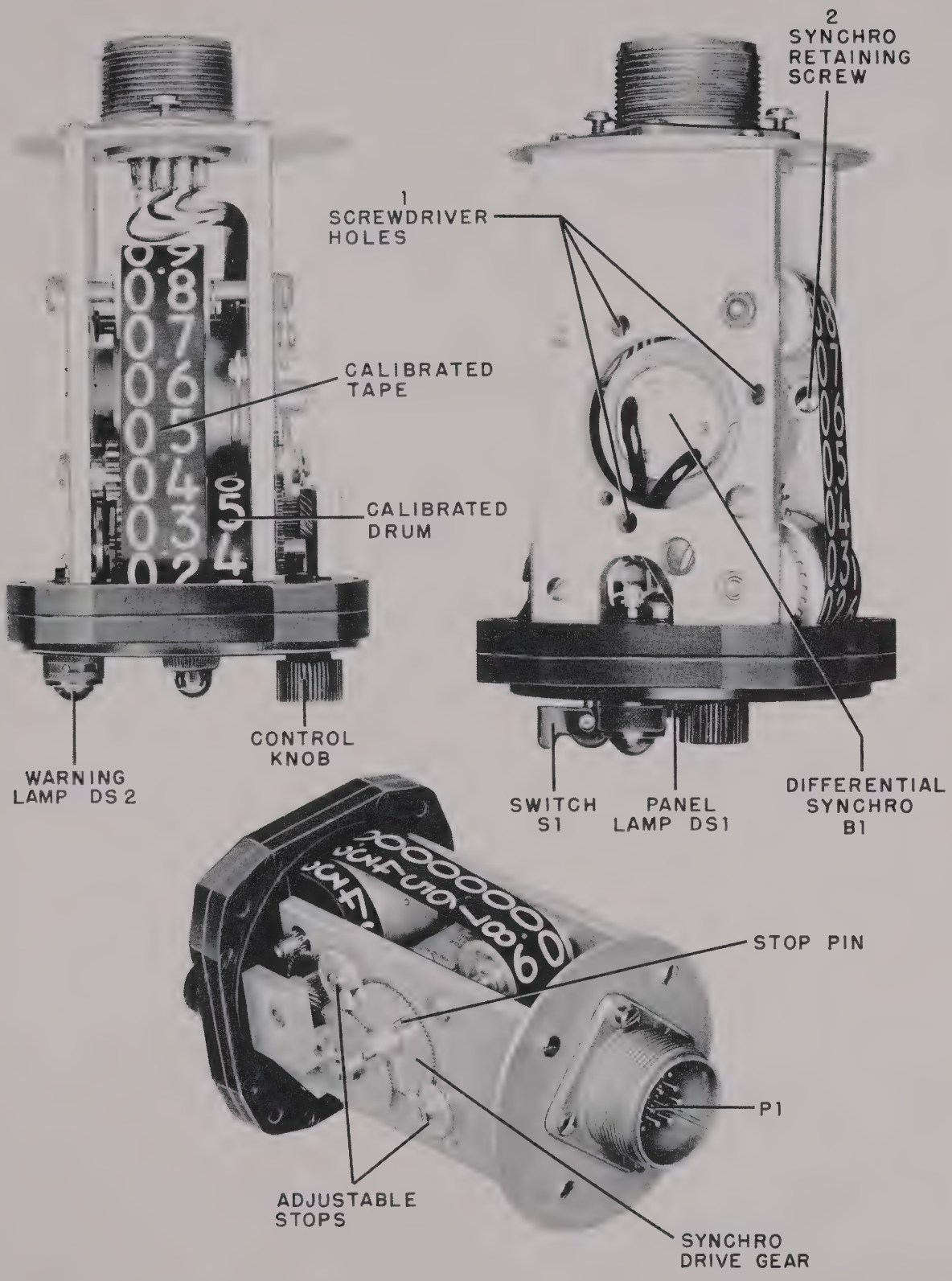

Figure 9-2. AZR-1A PPI Azimuth Rotator, Internal Views Showing Location and Identification of Parts

NOTES

NOTES

BENDIX RADIO

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BALTIMORE 4, MARYLAND

INSTRUCTION BOOK

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Type GYA-1A
STABILIZATION DATA GENERATOR

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I.B. 734-3

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December 1957

NOTICE

This instruction book (I. B. 734-3) is one of a series of instruction books for the Bendix type RDR-1 Airborne Radar System and should be placed in Instruction Book I. B. 734 [titled: RDR-1 Airborne Radar System Type CON-1( ) Controls and Accessories] after Instruction Book I. B. 734-2 (titled: RDR-1 Airborne Radar System Type AZR-1A PPI Azimuth Rotator).

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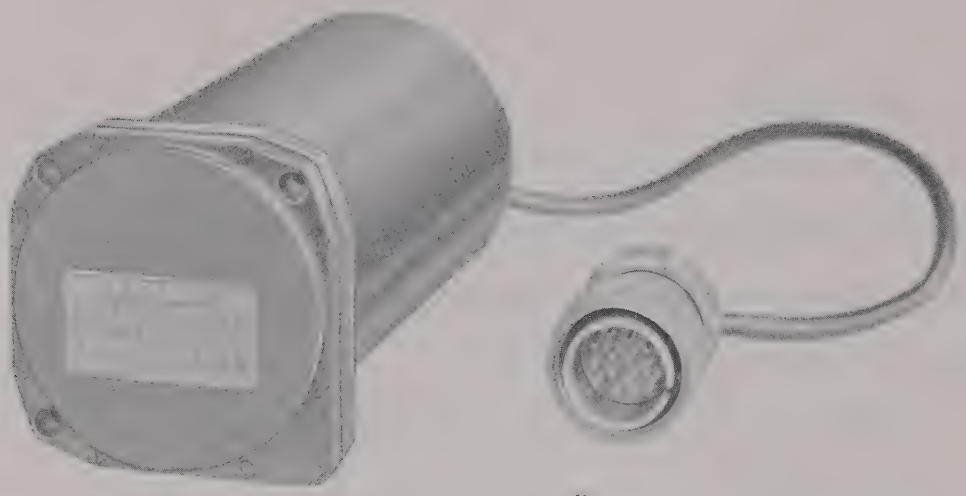
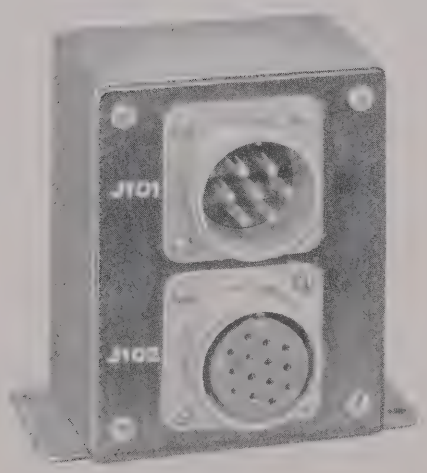


GYA-1A GYRO AND AUTOSYN UNIT



GYA-1A JUNCTION BOX DR-37-1A

Figure 1-1. GYA-1A Stabilization Data Generator, An Accessory For Type RDR-1 Airborne Radar Systems

SECTION I
GENERAL DESCRIPTION

1-1. GENERAL.

This instruction book (I.B. 734-3) describes the Bendix type GYA-1A Stabilization Data Generator, figure 1-1, hereinafter referred to as the GYA-1A. The GYA-1A is an optional accessory for the Bendix type RDR-1 Airborne Radar System.

1-2. FUNCTION OF EQUIPMENT.

The Bendix type RDR-1 Airborne Radar System requires an external source of roll and pitch data for antenna stabilization. Roll and pitch data are normally available from the vertical gyro in the aircraft's autopilot, if the aircraft is so equipped. If the aircraft is not so equipped the GYA-1A can be used to supply the required roll and pitch data.

1-3. DESCRIPTION OF EQUIPMENT.

a. GENERAL.--The GYA-1A consists of two units. The first is a three-inch instrument type panel-mounting unit containing a two-axis vertical gyro and two Autosyns (data generators). The second unit is a junction box (type DR-37-A1) which contains electrical components essential to the operation of the complete GYA-1A.

b. GYRO HOUSING UNIT.

(1) ELECTRICAL.--The gyro housing unit contains a two-axis vertical gyro with an internal two-ball erection system. All erection provisions are complete within the gyro housing and associated junction box. Each of the two gyro axes (roll and pitch) is equipped with an Autosyn (data generator) to provide roll and pitch output voltages of 50 (±10 per cent) millivolts-per-degree for aircraft roll and pitch attitudes within system stabilization limits. The GYA-1A operates on 115 (±5 per cent) volts,

400 (±5 per cent) cps single phase. Electrical connections to the gyro housing unit are made through a connector plug (type AN-3106B-20-27PW) on the end of a 12-inch pendant cable.

(2) MECHANICAL.--The vertical gyro is housed in a standard, panel-mounting, aluminum instrument case. The front cover is attached to the case with eight screws and a neoprene gasket between case and cover hermetically seals the unit.

c. JUNCTION BOX DR-37-A1.--The junction box consists of a small aluminum case with two mounting flanges. It contains an adjustable thermal time delay relay, two voltage dividing capacitors, an RC phase correcting network, a resistive load, a step-down transformer, and two AN type electrical connectors. The purpose of each electrical component is explained in section II. The junction box connects between the gyro housing and the radar system.

1-4. EQUIPMENT SUPPLIED.

The equipment supplied as a type GYA-1A Stabilization Data Generator (Bendix part number N221413-1) is listed in table 1-1.

TABLE 1-1. EQUIPMENT SUPPLIED

QUANTITY	TYPE NUMBER	NAME OF UNIT	BENDIX PART NO.
1	GYA-1A	Stabilization Data Generator	N221413-3
1	DR-37-A1	Junction Box	N221413-2

1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The GYA-1A is an accessory unit for use with type RDR-1 Airborne Radar Systems and, in addition to the equipment required for system installation and operation, requires a mating connector for jack J101 on the junction box, an interconnecting

cable for use between the junction box and the junction strip in the aircraft, and a one-quarter ampere fuse. The interconnecting wiring is shown in figure 3-2.

The mating connector required is type AN-3106-20-15S (straight), or type AN-3108A-20-15S if an angle connector is desired.

The interconnecting cable required is composed of two lengths of number 20 wire and two lengths of number 22 shielded pair. All wires must be stranded.

The one-quarter ampere fuse can be any type desired.

SECTION II
THEORY OF OPERATION

2-1. GENERAL.

The GYA-1A supplies roll and pitch angle data to the antenna stabilization servo system of the radar set. Operation of the radar set's antenna stabilization servo system is explained in the following publications.

1. RDR-1 (C-band) Airborne Radar System Instruction Book I.B. 733, paragraph 2-2f.
2. RDR-1 (X-band) Airborne Radar System Instruction Book I.B. 732, paragraph 2-2f.
3. RDR-1 Airborne Radar System Type ANT-1( ) Antennas Instruction Book I.B. 735, paragraph 2-5.

CAUTION

The gyro housing case is sealed against dust, dirt, and moisture. It is not recommended that this case be opened except to uncage the gyro as explained in section III and this should be done only in a dust-free low humidity area.

2-2. POWER REQUIREMENTS.

The GYA-1A operates on 115 (±5 per cent) volts, 400 (±5 per cent) cps and requires 14 VA at 88 per cent power factor while starting gyro motor, and 16 VA at 92 per cent power factor at full motor speed of 20,000 rpm. The operating voltage fed to pin C of connector J101 on the junction box is taken from the same phase that supplies the radar servo system reference voltage to pin 29 of connector P4001 on the SYN-1B Synchronizer-Amplifier-Power Supply. See the simplified schematic and interconnecting wiring diagram, figure 3-2.

2-3. GYRO STARTING AND ERECTING.

When primary power is applied to pins B and C of connector J101 on the junction box, 115 volts ac is applied across the heater element in thermal time delay relay K101 and across the primary winding of step-down transformer T101. Thermal time delay relay K101 is adjusted to introduce a nominal three-minute delay before power can be fed directly through it to the gyro motor. During the three-minute delay the gyro motor receives a reduced starting voltage through voltage dividing capacitors C102 and C103 which bridge the power contacts of relay K101. The gyro motor will start on the reduced voltage and will immediately start erecting.

The gyro is equipped with a two-ball erecting system and will erect to within two degrees of vertical within five minutes from the time power is applied, from any position of rest. Approximately three minutes after power is first applied the power contacts of relay K101 close and the full operating voltage is applied to the gyro motor. Within a total of 17 minutes from the time power is first applied the gyro will erect to within 0.6 degree of vertical.

2-4. OUTPUT VOLTAGES.

The gyro has an Autosyn (data generator) operating on each of its two axes. Each Autosyn acts like a variable transformer which changes rotor-to-stator (primary to secondary) ratio linearly with rotor-to-stator angular displacement.

The rotor (primary) of the PITCH Autosyn is energized with a 400-cps reference voltage tapped from a portion of one winding on the gyro motor.

The rotor (primary) of the ROLL Autosyn is energized with a 400-cps reference voltage from the secondary of step-down transformer T101 in the junction box.

When the gyro housing is level, with gyro running and erect, the rotor-stator coupling of each Autosyn is minimum. This provides a null output voltage from the ROLL and PITCH Autosyn stators which must not exceed 18 millivolts. The PITCH Autosyn output is measured between pins D and F and the ROLL Autosyn output is measured between pins E and A of jack J101 on the junction box.

THEORY OF OPERATION

The output of each Autosyn is a nominal 50 millivolts-per-degree of angular displacement of its stator from the null position.

For "dive " (nose down) attitude of the aircraft the phase angle of the PITCH Autosyn output voltage (at pins D and F of connector J101) leads the reference voltage, measured at pins B and C of connector J101, by 10 ±5 degrees.

For "climb" (nose up) attitude of aircraft the phase angle of the PITCH Autosyn output voltage leads the reference voltage by 190 ±5 degrees.

For "left bank" (left wing down) attitude of aircraft the phase angle of the ROLL Autosyn output voltage (at pins E and A of connector J101) leads the reference voltage, measured at pins B and C of connector J101, by 10 ±5 degrees.

For "right bank" (right wing down) attitude of aircraft the phase angle of the ROLL Autosyn output voltage leads the reference voltage by 190 ±5 degrees.

Capacitor C101 and resistor R101 form a phase correcting network in the output circuit of the PITCH Autosyn. Load resistor R102 across the ROLL Autosyn output acts as an impedance matching element between the ROLL Autosyn output and the ROLL amplifier input in the SYN-1B Synchronizer-Amplifier-Power Supply.

SECTION III
INSTALLATION

3-1. GENERAL.

The GYA-1A must be rigidly mounted so that its gyro housing case exactly follows all roll, pitch, and bank attitudes of the aircraft. The junction box (DR-37-A1) must be mounted close enough to the gyro housing case to permit interconnection by the cable pendant to the gyro housing case. Before a mounting location is selected all of the following factors must be considered.

3-2. GYA-1A ORIENTATION DATA.

Figure 3-1 defines the several axes of the antenna and the GYA-1A. Detail A shows that the gyro housing case must be mounted with its plug end forward. Detail B defines the gyro axes. Detail C shows that the gyro pitch axis must parallel the antenna tilt axis. Detail D shows that the gyro spin axis must parallel the azimuth spin axis of the antenna.

To further qualify the gyro orientation requirements the following is quoted from paragraph 3-2c of Instruction Book I.B. 735 covering type ANT-1( ) Antennas:

"ORIENTATION.--The mounting position of the antenna must satisfy the following conditions: Azimuth spin axis of antenna (9, figure 3-1) must parallel spin axis of the stabilizing vertical gyro; tilt axis of antenna (8) must parallel pitch axis of aircraft.

"To insure that targets are displayed in their proper relative positions with respect to the aircraft, the radar beam must radiate forward, perpendicular to the pitch axis of the aircraft, and in the plane of flight path when the antenna is positioned at zero degrees in both azimuth and tilt.

"The antenna stabilization system will function properly only when the azimuth spin axis of the antenna parallels the spin axis of the stabilizing vertical gyro. Should

an ambiguity exist between the two spin axes, an inherent error is developed in the system. This error is evidenced by uneven azimuth illumination of terrain as the antenna revolves. This condition is undesirable and may cause some confusion when interpreting the radar display. Therefore, it is important that the antenna and gyro spin axes be in coincidence (both pitch and roll planes) when the antenna is being mounted. The same reference criterion for mounting the gyro should be employed for leveling and mounting the antenna."

NOTE

Panel cutout and mounting hole data are included in the schematic diagram and dimensional outline drawing (figure 9-1).

It is recommended that the three mounting holes be slightly elongated to permit post-installation angular adjustment of the gyro roll axis in case satisfactory coincidence of the gyro spin axis and the azimuth spin axis of the antenna was not originally achieved.

3-3. ELECTRICAL CONNECTIONS.

Figure 3-2 is a simplified schematic diagram of the GYA-1A and includes a diagram of the essential interconnecting wiring between the GYA-1A and the radar system. This diagram should be used in conjunction with the radar system interconnecting wiring diagram, figure 3-4 in the system instruction book I. B. 732 (for X-band systems) or I. B. 733 (for C-band systems).

When connected as shown in figure 3-2 the gyro motor will start as soon as the aircraft generator supplying the a-c reference phase starts. An optional arrangement would be to insert an off-on switch in series with the a-c lead to pin C of connector J101 on the junction box to control gyro operation as desired.

3-4. GYRO CAGING CLIP.

a. GENERAL.--The GYA-1A as supplied is equipped with a gyro caging clip, (A, figure 3-3), as a preventive measure against possible damage to the gyro during shipping and handling. The caging clip confines the gyro in a fixed position within the case and the clip must be removed before final installation.

CAUTION

The gyro housing case is sealed against dust, dirt, and moisture. It is not recommended that this case be opened except to remove or replace the gyro caging clip and this should be done only in a dust-free low humidity area.

b. REMOVAL OF GYRO CAGING CLIP.

Step 1. Remove the eight screws which attach the front cover to the case.

Step 2. Use a knife edge as a wedge to loosen the front cover. Be careful not to damage the neoprene gasket. Remove front cover.

Step 3. Pull caging clip, slowly, straight forward out of the case. Retain caging clip for possible future use.

CAUTION

After caging clip is removed the gyro (B, figure 3-3) will swing free in its mount to the limits of gimbal action. Care should be exercised in handling the case to prevent unnecessary free swinging of gyro against gimbal stops. Do not leave gyro exposed longer than necessary.

Step 4. Replace front cover and make sure neoprene gasket is in place. The three mounting holes in the front cover and in the case front must be in alignment, then the front cover corner without a mounting hole identifies the lower right-hand corner of the unit.

3-5. TEST OF INSTALLATION.

a. GROUND TEST.--The GYA-1A installation in the aircraft can be ground tested to determine whether mounting and wiring is correct by following the procedure given in the system instruction book I.B. 732 or I.B. 733, paragraph 3-4d., steps 1 through 20.

b. FLIGHT TEST.--A flight test of the GYA-1A installation will quickly determine the total effectiveness of the installation and should be made as follows.

Fly at or above 5000 feet. Gyro must be running and fully erected. Radar must be operating. Use 50-mile scope range. Adjust antenna tilt down to scan an area of ground which provides usable targets or terrain configurations over a wide arc.

After a suitable scope display has been established fly a straight course while alternately making changes in the aircraft's attitude of approximately 10 degrees in climb, dive, right roll, and left roll in any sequence. Hold each attitude long enough to allow the indicator's sweep trace to make at least two full revolutions.

If the GYA-1A has been properly installed and connected the scope display will remain relatively stationary except for the range covered during time of test. Each revolution of the sweep trace must paint the same relative picture with negligible shifting of its position on the scope.

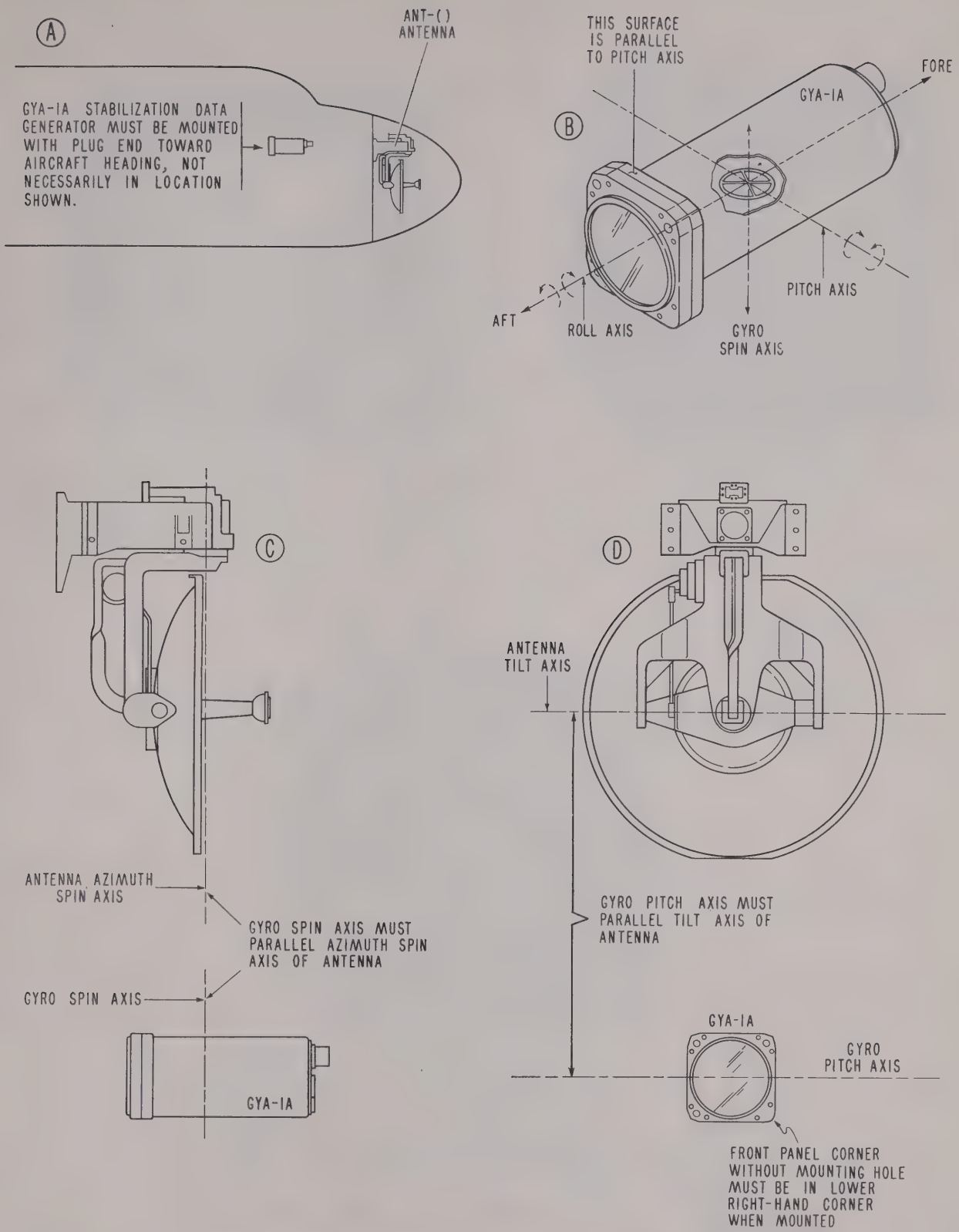
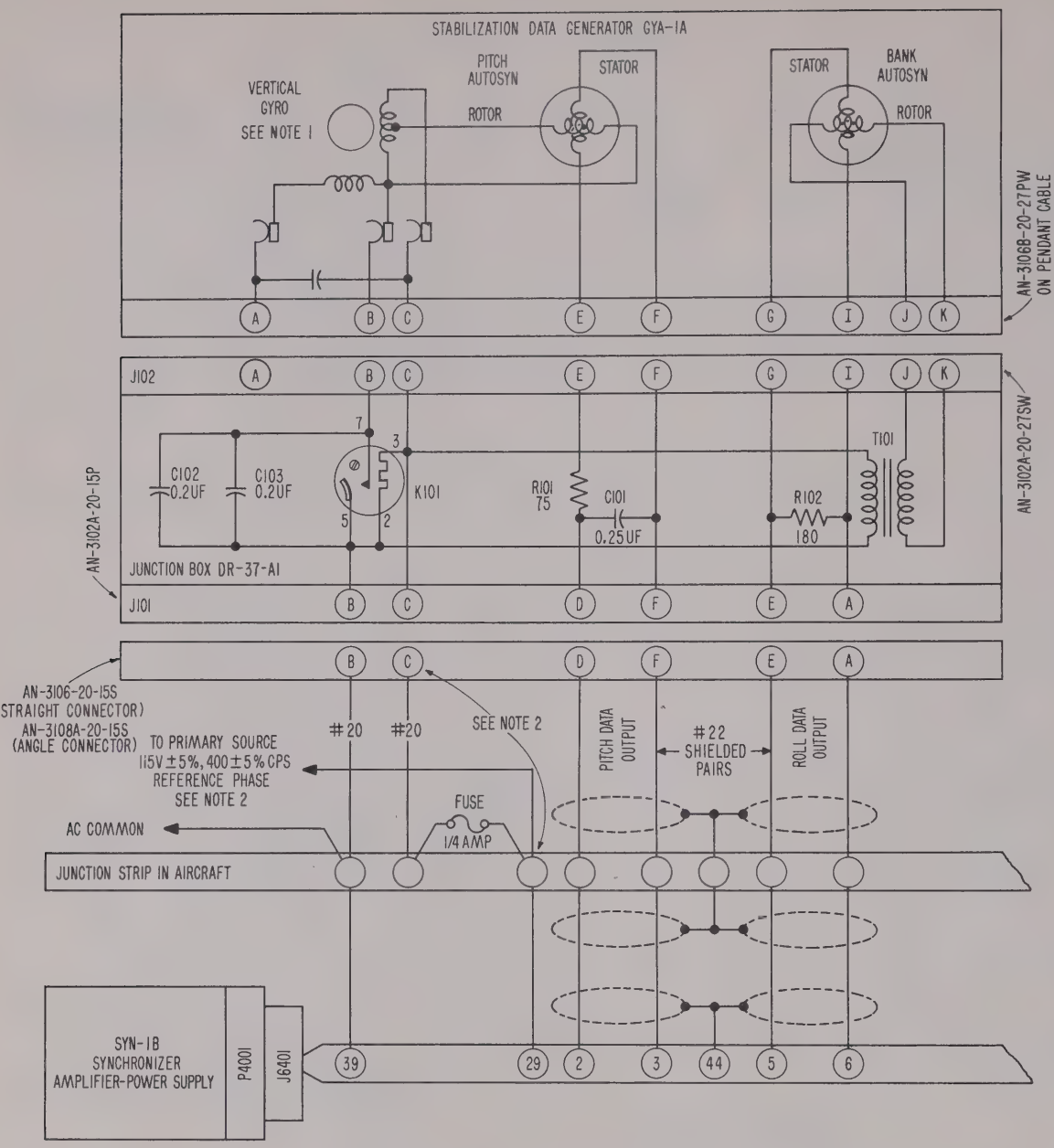


Figure 3-1. GYA-1A Stabilization Data Generator, Data For Mounting and Orienting



NOTES:

1. THE GYA-1A STABILIZATION DATA GENERATOR REQUIRES AN OPERATING VOLTAGE OF 115V ±5%, 400 ±5% CPS.

   THE POWER REQUIRED IS; 14VA AT 88% POWER FACTOR WHILE STARTING; AND 16VA AT 92% POWER FACTOR AT FULL SPEED OF 20,000 RPM.

   THE TWO-AXIS VERTICAL GYRO WILL ERECT TO WITHIN TWO-DEGREES OF VERTICAL WITHIN FIVE MINUTES AFTER POWER IS APPLIED, AND TO WITHIN 0.6-DEGREES OF VERTICAL WITHIN SEVENTEEN MINUTES, FROM ANY POSITION OF REST.

2. THE OPERATING VOLTAGE FED TO PIN C OF J101 ON THE GYA-1A JUNCTION BOX MUST BE TAKEN FROM THE SAME PHASE AS THE SERVO SYSTEM REFERENCE VOLTAGE FED TO THE SYN-1B SYNCHRONIZER-AMPLIFIER-POWER SUPPLY THROUGH PIN 29 OF PLUG P4001.

   A ONE-QUARTER AMPERE FUSE SHOULD BE INSERTED IN SERIES WITH THE 115-VOLT SUPPLY LEAD TO PIN C OF PLUG J101 ON THE GYA-1A JUNCTION BOX.

Figure 3-2. GYA-1A Stabilization Data Generator, Simplified Schematic Showing Interconnections to RDR-1 Airborne Radar System

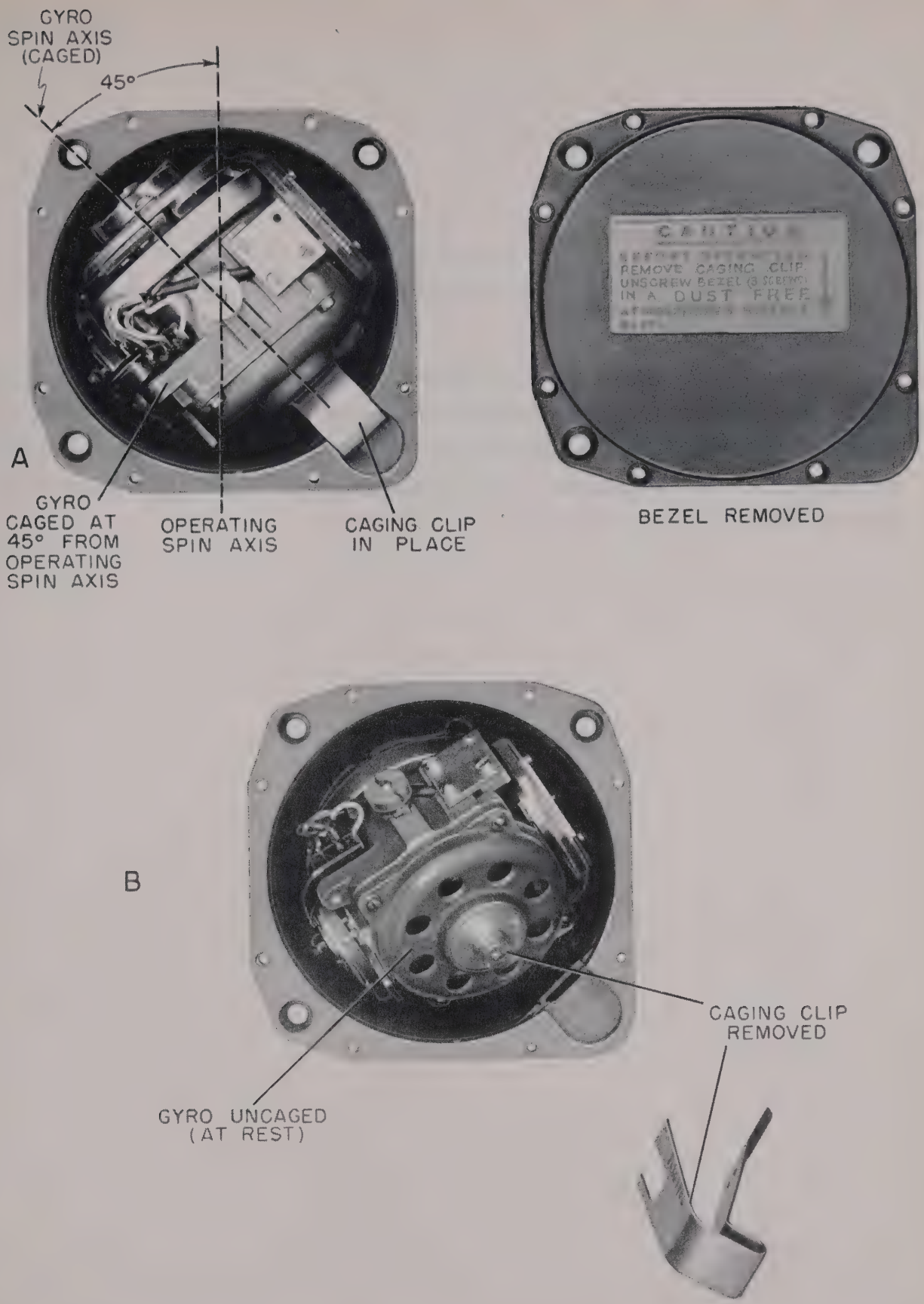


Figure 3-3. GYA-1A Stabilization Data Generator Showing Bezel Removed and Location of Caging Clip

SECTION IV
OPERATION

4-1. GENERAL.

Operation of the GYA-1A is completely automatic if wired into the radar system as shown in figure 3-2. If a separate gyro on-off switch is installed, as described in paragraph 3-3, the gyro must be turned on for at least 17 minutes before satisfactory stabilization will be achieved since the gyro requires approximately 17 minutes to erect to within 0.6 degree of vertical.

SECTION V
PREVENTIVE MAINTENANCE

5-1. GENERAL.

The GYA-1A requires no preventive maintenance; if malfunctioning is evident or suspected refer to section VI. The GYA-1A is designed to provide a minimum of 1000 hours of operation between overhauls.

SECTION VI
CORRECTIVE MAINTENANCE

6-1. GENERAL.

This section contains continuity and electrical test data for the GYA-1A and for its junction box. These tests are sufficiently inclusive to evaluate the unit electrically and operationally.

Field service or overhaul of the gyro unit is not recommended. If any unusual or special service problems arise, it is suggested that the Service Department, Bendix Radio, Division of Bendix Aviation Corporation, Towson 4, Maryland be contacted for advice or assistance.

Factory overhaul of the equipment is recommended when overhaul is indicated. No equipments should be returned to the factory until a return authorization (RA) form is requested and received from the Service Department of Bendix Radio.

6-2. TEST EQUIPMENT REQUIRED.

The test equipment required for GYA-1A test is listed in table 6-1.

TABLE 6-1. TEST EQUIPMENT REQUIRED FOR GYA-1A TEST

Oscilloscope, Tektronix, type 511AD, 531, or equivalent
Voltohmmeter, Triplett, type 630 or equivalent
A-c vtvm, Ballantine, type 310 or equivalent
Capacity Bridge
Power supply, 115 volts, 400 ±5 per cent cps
Connector, type AN3106-20-15S
Test stand (see figure 6-1 and paragraph 6-3)

6-3. TEST BENCH SETUP.

a. GYA-1A MOUNTING.--Figure 6-1 illustrates the proper mounting of the GYA-1A for electrical test. The gyro case is mounted on a panel which is perpendicular to a horizontal baseboard. The top bezel surface of the gyro case must be level within ±5 minutes. The back surface of the bezel must be vertical within ±5 minutes. The plug on the gyro output cable must be mated with connector J102 of junction box DR-37-A1. The junction box must be mounted on the baseboard of the test stand in any convenient location. A connector, type AN-3106-20-15S, with #22 stranded leads connected to pins A, B, C, D, E, and F must be mated with connector J101 on the junction box and the six leads must terminate on a terminal board with leads identified as shown in figure 6-1. The terminal board affords convenient test terminals. The test stand must be used on a level surface.

b. INPUT POWER REQUIREMENTS.--The electrical test requires 115 volts, 400 (±5 per cent) cps. The input power must be connected to terminals B and C of the terminal board, a-c common to terminal B.

6-4. CONTINUITY TESTS.

a. GENERAL.--A continuity test of the circuitry in the gyro housing case must be made, as in table 6-2, at the pin terminals of the pendant cable plug. Plug must be disconnected from junction box for this test.

A continuity test of the circuitry in the junction box must be made, as in table 6-3, at the pin terminals of connectors J101 and J102 while the junction box is disconnected from all other circuits.

TABLE 6-2. CONTINUITY TEST, GYRO HOUSING CASE CIRCUITRY

FROM PENDANT CABLE CONNECTOR PIN	TO PIN	READ ON OHMMETER
A	B	285 - 349 ohms
B	C	285 - 349 ohms
A	E	open
E	F	50 - 58 ohms
G	I	10.5 - 13 ohms
G	J	open
J	K	110 - 145 ohms
All pins to case ground		open

TABLE 6-3. CONTINUITY TEST, JUNCTION BOX DR-37-A1 CIRCUITRY

FROM CONNECTOR	PIN	TO CONNECTOR	PIN	READ ON OHMMETER
J101	B	J101	C	625 ±20% ohms
	D		F	open
	E		A	180 ±5% ohms
	B	J102	B	open
	C		C	short
	D		E	75 ±5% ohms
	F		F	short
	E		G	short
	A		I	short
J102	J		K	55±10% ohms
All pins to case ground				open

6-5. CAPACITY TESTS.

The capacitors in junction box DR-37-A1 must be tested as in table 6-4.

TABLE 6-4. CAPACITY TESTS, JUNCTION BOX DR-37-A1

FROM CONNECTOR	PIN	TO CONNECTOR	PIN	READ ON CAPACITY BRIDGE
J101	B	J102	B	0.4 uf ±10% (relay K101 cold)
	D		F	0.25 uf ±5%

6-6. ELECTRICAL AND OPERATIONAL TESTS.

a. JUNCTION BOX DR-37-A1.

(1) RELAY K101 TEST.--Relay K101 is an adjustable, thermal, time-delay relay preset to close contacts 5 and 7 from 180 to 195 seconds after 115 volts, 400 cps is applied to pins B and C of connector J101.

Step 1. Disconnect junction box from all other circuits.

Step 2. Connect an ohmmeter between pin B of J101 and pin B of J102. Ohmmeter must show open circuit (heater element in relay cold).

Step 3. Apply 115 volts, 400 cps between pins B and C of J101 and note exact time of application.

Step 4. Watch ohmmeter. Ohmmeter must show closed circuit in 180 to 195 seconds after ac is applied as in step 3.

NOTE

Relay operating time may be less if reoperated within 15 minutes of a previous relay operation.

Step 5. Disconnect ohmmeter and ac from junction box.

(2) TRANSFORMER T101 TEST.

Step 1. Connect an a-c vtvm between pins K and J of J102. Use 100-volt meter scale.

Step 2. Connect 115 volts, 400 cps between pins B and C of J101.

Step 3. Read voltmeter. Voltmeter must read 15.7 volts ±10 per cent which is the correct transformer output for a 115-volt input.

Step 4. Disconnect voltmeter and ac from junction box.

(3) PHASING TEST, TRANSFORMER T101.

Step 1. Connect a jumper wire between pin C of J101 and pin K of J102.

Step 2. Connect an a-c vtvm between pin B of J101 and pin J of J102.

Step 3. Apply 115 volts, 400 cps between pins B and C of J101.

Step 4. Read voltmeter. Voltmeter must read approximately 100 volts to indicate that transformer T101 is properly connected to deliver a reference voltage of proper phase.

Step 5. Disconnect ac, voltmeter, and jumper wire from junction box.

b. GYRO AND AUTOSYN UNIT.

(1) GENERAL.--For the following tests the GYA-1A must be mounted as shown in figure 6-1. Primary power should be applied as required and should be maintained at 115 volts throughout the tests. Gyro must be uncaged; refer to paragraph 3-4.

The Autosyn output voltages specified in the following tests correspond to the absolute values of angular position of the gyro. These voltages do not include inherent null voltages of the Autosyns at true null position. The inherent null voltage must be determined and added to the specified limit voltages. Null voltages are determined after gyro is erected.

The following tests are to be made at atmospheric pressure (approximately 29.92 inches of Hg) and at room temperature (approximately +25° C, +77° F).

(2) GYRO ERECTION RATE.

Step 1. Make sure gyro test stand is level, as in figure 6-1, and that thermal relay K101 has not been operated for 20 minutes.

Step 2. Apply 115 volts, 400 cps to terminal board terminals B and C and note time of application.

NOTE

The gyro must erect to within two degrees of vertical, from any position of rest, within five minutes from the time power is applied. Two degrees corresponds to an Autosyn (ROLL and PITCH) output of 100 millivolts (plus inherent null voltage with case level) as measured between terminal board terminals E and A for ROLL, and between terminals D and F for PITCH.

Step 3. Five minutes after power is applied measure the voltage output at terminal board terminals E and A, and then at terminals D and F to determine that the gyro has erected to within two degrees of vertical as in note above.

NOTE

The gyro must erect to within 0.6 degree of vertical, from any position of rest, within a total of 17 minutes from the time power is applied. Six-tenths of a degree corresponds to an Autosyn (ROLL and PITCH) output of 30 millivolts (plus inherent null voltage with case level) as measured between terminal board terminals E and A for ROLL, and between terminals D and F for PITCH.

Step 4. Seventeen minutes after power is first applied, as in step 2, measure the voltage output between terminal board terminals E and A, and then between terminals D and F, to determine that the gyro has erected to within 0.6 degree of vertical as in note above. Leave power applied.

(3) NULL VOLTAGE DETERMINATION.

Step 1. Connect an a-c vtvm to terminal board terminals E and A for ROLL; terminals D and F for PITCH.

Step 2. Use lowest possible voltmeter scale and determine when output voltage has reached its lowest level (meter needle stops falling). This should occur some 20 minutes after power is first applied.

Step 3. Measure null voltage at terminal board terminals E and A and record reading as "ROLL null".

Step 4. Measure null voltage at terminal board terminals D and F and record reading as "PITCH null". Null voltage must not exceed 18 millivolts with case level.

(4) ANGULAR FREEDOM OF GYRO.--With the gyro running and erect, displace the test stand slowly to 40 degrees in right ROLL (θA, figure 6-1), then to 40 degrees in left ROLL (θB), then to 60 degrees in DIVE (θC), and then to 60 degrees in CLIMB (θD). The gyro must not tumble in any of these extreme positions.

(5) ROLL AUTOSYN SENSITIVITY.

Step 1. Position gyro test stand for optimum null voltages.

Step 2. Displace test stand slowly to 20 degrees in right ROLL (θA).

Step 3. Measure output voltage at terminal board terminals E and A. Output must be between 900 and 1100 millivolts.

Step 4. Displace test stand slowly to 20 degrees in left ROLL (θB).

Step 5. Measure output voltage between terminal board terminals E and A. Output voltage must be between 900 and 1100 millivolts.

Step 6. Return test stand to level position.

(6) ROLL AUTOSYN OUTPUT PHASING.--For right ROLL (θA) the phase angle of the signal (output) voltage, as measured from terminal board terminals

A to E, must lead the reference (primary) voltage, as measured from terminals B to C, by 190 ±5 degrees.

For left ROLL (θB) the phase angle of the signal (output) voltage, as measured from terminal board terminals A to E, must lead the reference (primary) voltage, as measured from terminals B to C, by 10 ±5 degrees.

(7) PITCH AUTOSYN SENSITIVITY.

Step 1. Position gyro test stand for optimum null voltages.

Step 2. Displace test stand slowly to 20 degrees in DIVE (θC, figure 6-1).

Step 3. Measure output voltage between terminal board terminals F and D. Output voltage must be between 900 and 1100 millivolts.

Step 4. Displace test stand slowly to 20 degrees in CLIMB (θD).

Step 5. Measure output voltage between terminal board terminals F and D. Output voltage must be between 900 and 1100 millivolts.

Step 6. Return test stand to level position.

(8) PITCH AUTOSYN PHASING.--For DIVE (θC) the phase angle of the signal (output) voltage, as measured from terminal board terminals F to D, must lead the reference (primary) voltage, as measured from terminals B to C, by 10 ±5 degrees.

For CLIMB (θC) the phase angle of the signal (output) voltage, as measured from terminal board terminals F to D, must lead the reference (primary) voltage, as measured from terminals B to C, by 190 ±5 degrees.

(9) RESIDUAL VOLTAGE LIMITS.--After the test stand has been displaced 20 degrees in ROLL or PITCH for any of the preceding tests, return the test stand to its level position and measure the signal voltage between terminal board terminals A and E and between terminals D and F. Upon return to the level position the output of either Autosyn must not exceed 35 millivolts and must return to 18 millivolts or less in not more than two minutes.

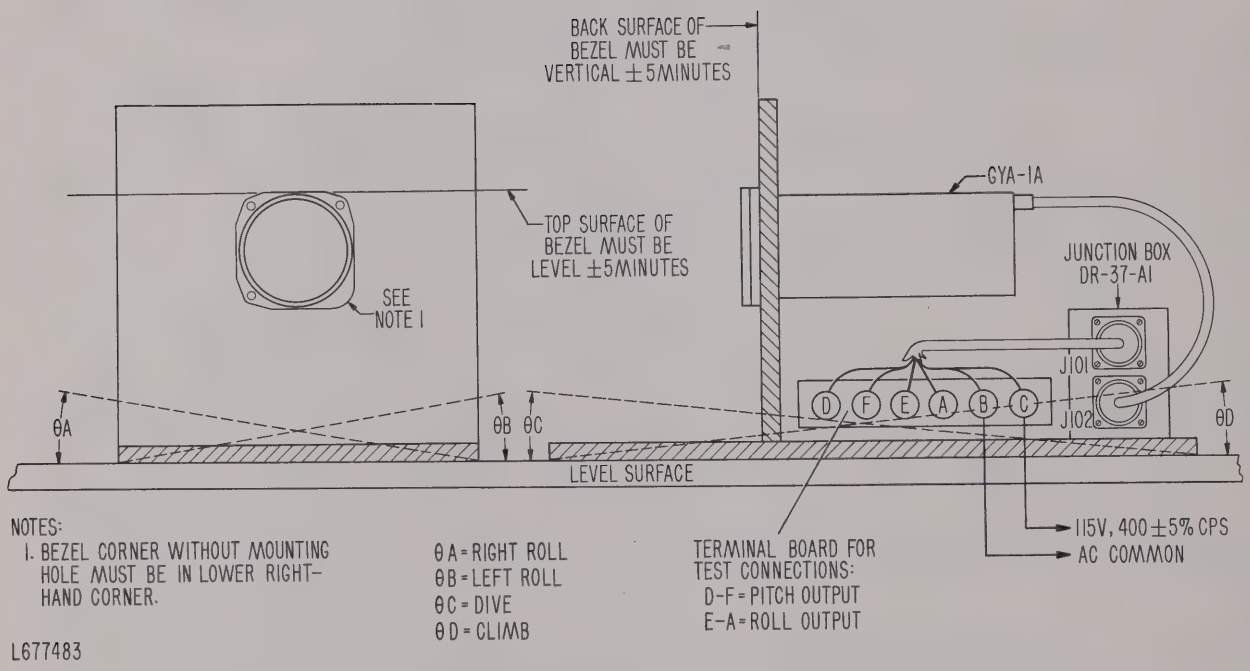


Figure 6-1. Test Stand for Bench Test of GYA-1A Stabilization Data Generator

SECTION VII
SUPPLEMENTAL DATA AND MODIFICATIONS

7-1. GENERAL.

This section is reserved for possible future changes, additions, or modifications.

SECTION VIII
PARTS LIST

8-1. GENERAL.

The parts list included herewith is for electrical components of Junction Box DR-37-A1 only.

ELECTRICAL PARTS LIST: TYPE DR-37-A1 JUNCTION BOX, PART OF TYPE GYA-1A STABILIZATION DATA GENERATOR

SYMBOL DESIG-NATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
C101	Capacitor, 0.25 uf, 200 VDCW	EP 713331-25
C102, 3	Capacitor, 0.2 uf, 115 VDCW	EP 713331-33
K101	Relay, thermal time delay, 180-second nominal delay	EP 1242336-1
R101	Resistor, 75 ohms, 1/2 watt, comp	EP RC20BF750J
R102	Resistor, 180 ohms, 1/2 watt, comp	EP RC20BF181J
T101	Transformer, voltage stepdown 7.3:1	EP 1242343-1
J101	Connector (Type AN3102-20-15P)	
J102	Connector (Type AN3102-20-27SW)	

SECTION IX
ILLUSTRATIONS

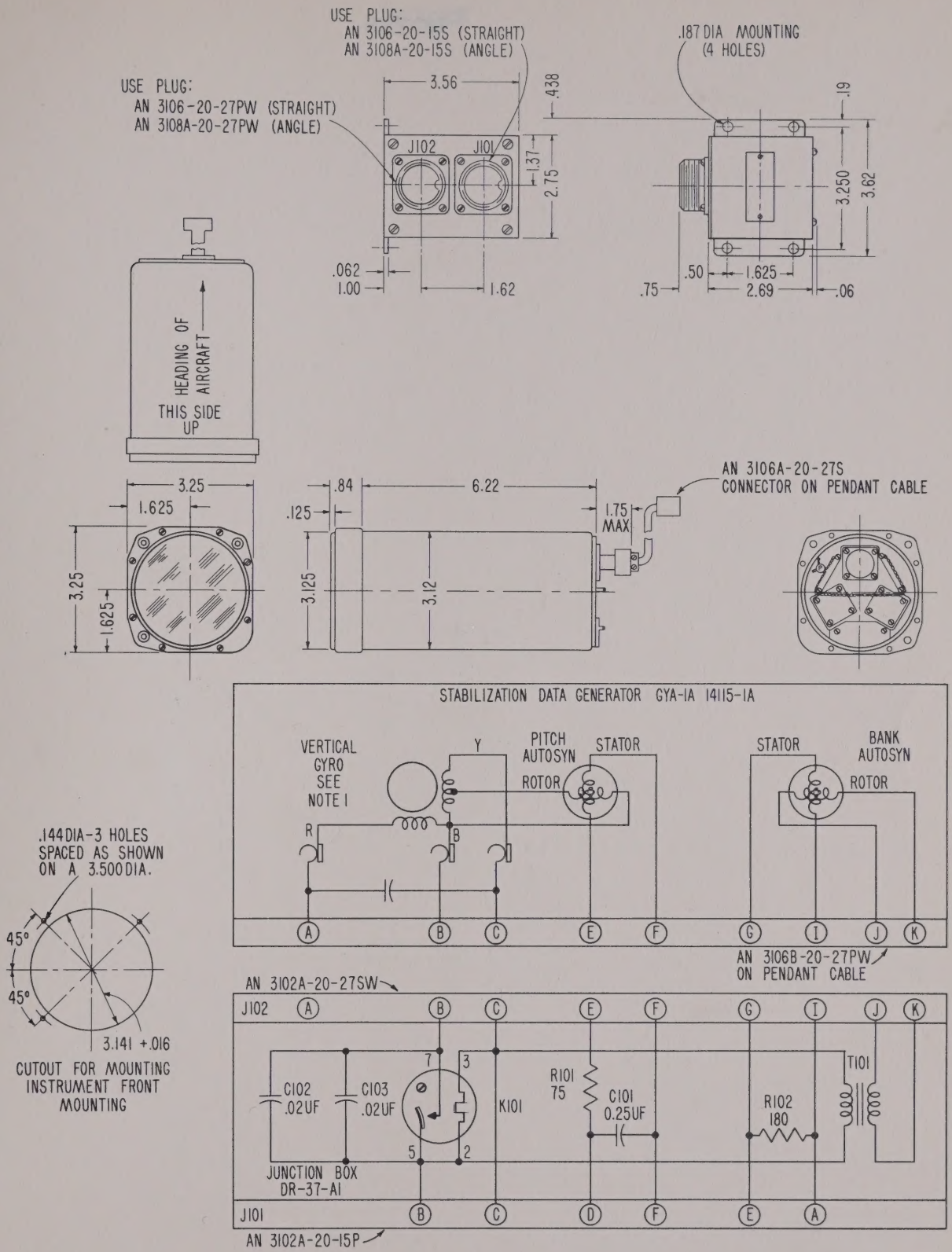


Figure 9-1. GYA-1A Stabilization Data Generator and Junction Box DR-37-A1, Schematic Diagram and Dimensional Outline Drawings

NOTES

NOTES

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